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OF THE

ROYAL AGRICULTURAL SOCIETY

OF ENGLAND.

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VOLUME THE NINTH.

PRACTICE WITH SCIENCE

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(Dating from the Foundation of the Society :

"The Society will not be responsible for the accuracy of the statements or conclusions contained in the several papers in the Journal, the authors themselves being solely responsible."

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Erratum.

In Part III. of vol. VIII. of the JOURNAL (issued on September 30, 1897), at p. 501, the estimated number of eggs in a ton was miscopied by the writer as 144,000, whereas it should be 14,400; the total received by the Ship Canal should accordingly be 1,334,100 instead of 13,341,000. The weight of packages is included in this commercial estimate of the number of eggs in a ton.

DIRECTIONS TO THE BINDER.

All the pages of text (1 to 808) should come first in the bound volume; and the pages of Appendix (i to ccx) at the end.

Text :—Pages 1 to 212 of the text are included in Part I. (March 31, 1898); pages 213 to 428 in Part II. (June 30, 1898); pages 429 to 580 in Part III. (Sept. 30, 1898); and pages 581 to 808 in Part IV. (December 31, 1898).

Appendix : Pages i to xliv are included in Part I.; xlv to lxxiv in Part II.; lxxv to clxxviii in Part III.; and clxxix to ccx in Part IV.

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JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

THE BOARD OF AGRICULTURE, 1793 – 1822.

READERS of the agricultural biographies contributed to these pages during the last few years [1] will be to some extent familiar with the work of the Board of Agriculture, which existed from 1793 to 1822. I now propose to continue the story, and to give, in the Journal of the Society that is the modern equivalent of the Board, an account of its labours and its labourers, as complete as the materials and the space available for the purpose will allow. The narrative, as it proceeds, will show that most of the departments of the Society, to-day so usefully active, were essayed in more or less rudimentary forms by the Board of Agriculture. It will prove that the founders of the Royal Agricultural Society of England were enabled by experience gained from the Board's ultimate failure to avoid those elements of weakness that had led to it, and to organise an agricultural institution free, national, non-political, and independent—whose long-successful career is the best proof of the wisdom and stability of its original principles.

Various agricultural writers have at different times put forth suggestions for the foundation of a national agricultural institution. Some have even traced the idea to the days of the Commonwealth, when in 1651 Samuel Hartlib propounded a scheme in a pamphlet with the ponderous title "An Essay for Advancement of Husbandry-Learning: or, Propositions for the Erecting a Colledge of Husbandry: and In order thereunto, for the taking in of Pupills or Apprentices, And also Friends or Fellowes of the same Colledge or Society."

These "Propositions" were not Hartlib's own, as indeed few of

[1] See especially those of Arthur Young (vol. iv., 1893), Sir John Sinclair (vol. vii., 1896), and Lord Somerville (vol. viii., 1897).

the agricultural writings customarily ascribed to him were. He speaks in his preface of "these Hints to the Publique" as having "a long time lain by me," and there are reasons, too long to detail here, for believing the "Propositions" to have been from the pen of Cressy Dymock,[1] one of the numerous impecunious writers who were Hartlib's satellites. The writer bases his arguments on the fact that "there hath been earnestly desired the erection of a private Colledge or Society of good husbandry, wherein some may teach, some learne, and all practise the whole and every part of this so honourable an art, so deep a mystery, and that not onely in the more customary and common way: but according to the most excellent rules that ingenuity and experience gained by rational trials and real experiments have or can attaine to."

There were to be contributors of different sorts to this College, as well as "freemen or friends and Members of the Society." As to the latter, "he must pay down at his entrance fifty pound, as given to the Society for the encouragement of Ingenuity in the practise of Experiments, for the obtaining of yet more and more perfection in this (almost) infinite Science." But residence at the College appears to have been incumbent on the members: so that Hartlib's (or Dymock's) scheme bears no relation at all to what was understood in the last century as a Board of Agriculture, and by ourselves as an Agricultural Society. Lord Somerville was therefore wrong when in his "System followed by the Board of Agriculture" (1800) he said that the idea of such a Board "was suggested by an old writer, Samuel Hartlib;" and he was still more wrong when he said, "It was so much approved of as to obtain for the author a pension, not inconsiderable in those days, of 100*l.* per annum from Oliver Cromwell." Hartlib's pension was, as a matter of fact, given to him in 1646, four years before he appeared in the guise of editor of any agricultural publication, and it was bestowed upon him for "his very good service to the Parliament,"[2] which doubtless included the evidence he gave against Laud at the trial for high treason that resulted in the Archbishop's beheadal.

Suggestions for a Board of Agriculture.

The successful efforts of Sir John Sinclair in 1793 to persuade Pitt to allow a Board of Agriculture to be established appear to have been followed by attempts to rob him of some of

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[1] See, *e.g.*, Boyle's *Letters*, vol. v., 1745, p. 259.
[2] Journal of House of Commons for June 25, 1646.

the credit of suggesting it. Sir John himself writes that he "knew nothing of such a measure having been recommended by any other individual"—

To trace the steps whence useful establishments originated is at all times desirable and useful, but it is perhaps necessary on the present occasion, as some have supposed that the idea of such a Board was borrowed from this or that author, who incidentally might have previously suggested plans of a similar kind. Had it been so, I should have readily acknowledged it; for the difficulty attending such an attempt is, not to propose a plan, but to carry it into execution. It may be sufficient, however, to declare that I knew nothing of such a measure having been recommended by any other individual previously to its having been proposed by myself. (*Communications to the Board of Agriculture*, vol. i., 1797, p. iii.)

Yet that some such organisation had been previously mooted can hardly have escaped Sir John's vigilant eye.

Arthur Young mentions the three words "Board of Agriculture" in an argument as to the advantages of reclaiming waste lands which appeared in Vol. iv. of his *Northern Tour*, published in 1769. (Letter XL. p. 398.) His ideas on the subject appear at that time to have been extremely nebulous; but by prefixing (in Vol. xxi. of his *Annals*, 1793) to his report of Sir John Sinclair's speech in Parliament urging the establishment of the Board, an invitation to the reader to turn to Vol. iv. of his *Northern Tour*, Young appears to be desirous of claiming some of the credit.

A less amenable claimant was William Marshall, who devoted an unnecessary proportion of his admitted talents to flagellating the Board of Agriculture and all its works in his *Review and Abstract of the County Reports*. Marshall says on pages xix to xxiii of his Introduction that in February 1790 he submitted to the Society of Arts a "Plan for Promoting Agriculture," in which the following paragraph appeared:

I think it right to intimate the probable advantages which might arise from a Board of Agriculture, or, more generally, of Rural Affairs, to take cognisance, not of the state and promotion of Agriculture merely, but also of the cultivation of wastes and the propagation of timber bases on which not commerce only, but the political existence of the nation is founded.

Marshall states that in December 1790 Sir John Sinclair sought his acquaintance, but that it was not until the spring of 1793 that Sir John apprised him of his intention to bring the proposed Board before Parliament.

He showed me his plan, and during my short stay in London repeatedly consulted me on the subject. At the time of my leaving town there did not appear to be the smallest probability of the measure being adopted: even its promoter assured me that he had no hope of its being then carried into effect.

Hardly, however, had Marshall reached the Highlands before the public prints announced the appointment of the Board, with the names of the President and Secretary. His reflection is: "Thus fled my hope of credit (which I really expected) and all chance of profit (which I had not desired) from my proposed Board of Agriculture." And, with the vehemence of language that was his leading characteristic,[1] he calls the transaction "a job: and the only doubt that remained [in the minds of those whom he consulted] appeared to be, whether the measure (weighty as it might be) was adopted to avoid the importunities and quiet the still more ambitious cravings of the President, or to embrace a fair opportunity of rewarding a recent change of political sentiments in the Secretary."

This was hardly just, but there was a certain element of truth in it; for it is undeniable that the establishment of the Board was at length assented to by Pitt, after he had previously refused it,[2] in return for services in connection with an issue of Exchequer Bills, rendered to the Government by Sir John Sinclair. "The value of my father's services in restoring commercial confidence in a great national emergency was," says his son and biographer,[3] "fully appreciated by Mr. Pitt. He sent for the Baronet to Downing Street, and expressed in emphatic terms his sense of obligation. 'There is no man,' said he, 'to whom Government is more indebted for support and for useful information on various occasions than to yourself, and if you have any object in view, I shall attend to it with pleasure.'" Sinclair thereupon requested support to his proposal for the establishment of a Board of Agriculture, which Pitt consented to give, conditionally upon the sense of the House of Commons being generally favourable to the idea.

But a more concrete proposal than either Young's or Marshall's deserves to be noted. In 1776, the famous Scotch lawyer, philosopher, and critic, Henry Home, better known as Lord Kames, published in his eightieth year a book entitled *The Gentleman Farmer.* A whole chapter of this work is devoted to a scheme for "A Board for Improving Agriculture," the objects and functions of which were almost

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[1] Arthur Young says in his Diary that on February 22, 1806, he took a walk to Kensington Gardens Gate, in the course of which he saw Marshall. He adds: "I never see and converse with him but I think I see the haughty, proud, ill-tempered, snarling disgusted character which he manifested in his connection with Sir John Sinclair. A thousand pities that so extremely able a man—for of his talents there can be no question—should not have more amenity and mildness." *Autobiography* (published in January 1898), p. 427.

[2] See *Memoirs of Sir John Sinclair*, 1837, vol. ii., p. 48.

[3] *Ibid.*, vol. i., p. 252.

exactly those subsequently propounded by Sir John Sinclair. There was to be "a Board of nine members, the most noted for skill in husbandry and for patriotism." They were to have "an able secretary," whose duties are defined in detail. "As punctual attendance is necessary, the good behaviour of such an officer may well entitle him to a salary of 100*l*. yearly. . . . A larger salary would be an object of interest, and soon degenerate into a sinecure."

There were to be regular meetings of the Board once a month. Its first duty was "to make out a state of the husbandry practised in the different counties." It was to issue "a paper of instructions for improving husbandry, suited to the soil and situation of every district." An inspector of the Board was to report on progress, and advise farmers when necessary. Silver medals were to be bestowed on the most deserving, to "rouse emulation in all and promote industry." The Board was to "consider it as a capital branch of business to answer queries and to solicit a correspondence with men of skill." They were to keep themselves acquainted with every invention that tended to improve the art, and publish what they thought useful. Premiums were to be given to those who profited most by the instructions of the Board. They were to conduct experiments and to publish their transactions annually.

All this bears, as will be seen, a striking resemblance to the operations of the Board of Agriculture when established, and to those of agricultural societies of modern times.

Establishment of the Board.

From whom, if from anybody, Sinclair got ideas about the constitution or functions of the Board, he deserves all credit for having brought the scheme to a practical and successful issue. Having previously obtained Pitt's assent to his motion, though he says[1] Pitt and Lord Melville were the only members of the Cabinet who supported the establishment of the Board, he proceeded on May 15, 1793, to move in a very thin House the following Address to the Crown:—

That an humble Address be presented to His Majesty, entreating that His Majesty would be graciously pleased to take into his Royal consideration the advantages which might be derived by the public from the establishment of a Board of Agriculture and Internal Improvement: Humbly representing to his Majesty that, though in some particular districts, improved methods of cultivating the soil are practised, yet that, in the greatest part of these kingdoms, the principles of Agriculture are not yet sufficiently understood,

[1] *Correspondence of Sir John Sinclair*, 1831, vol. i., p. 88.

nor are the implements of husbandry, or the stock of the farmer, brought to that perfection of which they are capable: That his faithful Commons are persuaded, if such an institution were to take place, that such inquiries might be made into the internal state of the country, and a spirit of improvement so effectually encouraged, as must naturally tend to produce many important national benefits, the attainment of which His Majesty has ever shown a most gracious disposition to promote; and, in particular, that such a measure might be the means of uniting a judicious system of husbandry to the advantages of domestic manufacturing industry, and the benefits of foreign commerce, and consequently of establishing on the surest and best foundations the prosperity of his kingdoms: And if His Majesty shall be graciously pleased to direct the institution of such a Board for a limited time, to assure His Majesty that his faithful Commons will cheerfully defray any expense attending the same to the amount of a sum not exceeding 3,000*l.*

The motion was seconded by Lord Sheffield, and after various Members of the Government and others had spoken in favour of it, the debate was adjourned until May 17, 1793. On this occasion considerable opposition was manifested to the proposal. Some thought the ground was already sufficiently covered by the Society of Arts, which had subsisted for forty years, was in receipt of voluntary contributions to the amount of 1,200*l.* a year, and distributed 800*l.* a year in premiums. Others, notably Fox, objected to the Board as likely to be converted into "an instrument of influence." Sheridan moved an amendment to substitute for the latter part of the Address the following words: "Provided the same shall not be attended with any expense to the public." This amendment was negatived, and Sinclair's original motion for an Address to the Crown then triumphantly passed the House of Commons by 101 votes to 26. The Royal Assent to the scheme being speedily signified, the law officers of the Crown proceeded to consider the means of giving effect to it. They appear to have been somewhat doubtful as to the exact form which the new body should take—whether its powers should be derived from a Royal Commission as an exercise of the King's prerogative, or from a Royal Charter to a corporate body. The latter was adopted as the more constitutional procedure, as giving larger powers, and as following the precedents of the Royal and other learned Societies.

Sinclair's characteristic enthusiasm is illustrated by an incident connected with the sealing of the Charter. Having got over his difficulties with Scott, the Attorney-General (afterwards Earl of Eldon), and Mitford, the Solicitor-General (afterwards Lord Redesdale), about the form of the Charter, he made haste to convene a meeting of the new Board for Thursday, August 22, and he sent the Charter for sealing to Lord

Chancellor Loughborough the day before, with a note that he trusted the *forms* of affixing the Great Seal would be gone through quickly, "as several gentlemen had come to town to attend the meeting to-morrow.' Lord Loughborough waited till the evening of the 23rd, and then wrote a note in which he spoke of its being "a very sacred duty to attend with the most exact care to every instrument of an unusual nature," and added, "It must indeed be supposed that to affix the Great Seal is a mere form, if it is to be gone through so quickly."[1] The first meeting of the Board had therefore of necessity to be postponed.

Whatever the date of actual sealing, the Charter (which is now in possession of the Royal Agricultural Society) bears the date, August 23, 1793 (when the Chancellor wrote his angry letter), and is to the effect that "George the Third by the Grace of God, King of Great Britain, France, and Ireland, Defender of the Faith, and so forth, had ordained, given, and granted that there should be for ever hereafter a Board or Society which should be called by the name of the Board or Society for the Encouragement of Agriculture and Internal Improvement," of which Board or Society His Majesty declared himself to be the "Founder and Patron."

By the Charter the Board was constituted of a President, sixteen *ex-officio* and thirty Ordinary Members. They were empowered to appoint as many Honorary Members "as to them shall seem meet," and also Corresponding Members, "natives or foreigners." The former were entitled to be present at all meetings of the Board, but were not to vote on "any question to be agitated thereat." The latter had no right of attendance or vote. An annual meeting of the Board for the election of its President and other officers was fixed to take place on or about the 25th March. At this meeting five of the Ordinary Members were to retire in favour of five Honorary Members selected by the Board. Casual vacancies during the year were to be filled up by the remaining members. The President was empowered to nominate four deputies from amongst the Ordinary Members, one of whom, the senior in nomination present, should take his place when absent. The officers of the Board, in addition to the President, were to be one Treasurer, one Secretary, two or more Surveyors for examining into the state of the husbandry of the kingdom, one Under-Secretary, and one or more clerk or clerks, together with such agents and other officers as might be found useful. By a decision of the Board of

[1] *Memoirs of Sir John Sinclair*, 1837, vol. ii., p. 56.

March 18, 1800, Honorary Members were allowed to take part in debates, except such as related to the internal business and constitution of the Board. Their privileges, therefore, in this respect were analogous to those now enjoyed by Governors of the Royal Agricultural Society.

From what has been stated, it will be seen—and it is important to bear this in mind—that the Board was not a Government Department according to our modern acceptation of the term, but was essentially a Society for the encouragement of agriculture, as the Royal Society of London is for the encouragement of general science. Like that society, the Board was supported by Parliamentary funds; but the Government of the day had only a limited control over its affairs, through the *ex-officio* Members, and a transference of political power from one party to another did not necessarily affect its policy or administration. The Board exercised none of the executive functions of Government.

The following is the complete list of the Board, as originally constituted by the Charter:—

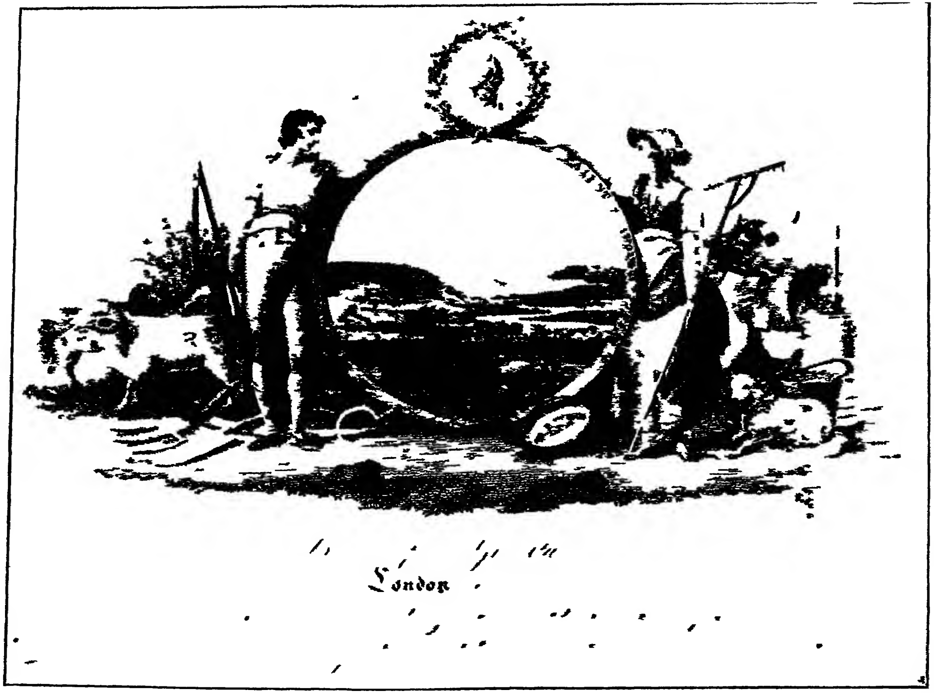
Ex-officio Members (16).

The Archbishops of Canterbury and York, the Lord Chancellor, the Lord President of the Council, the Lord Keeper of the Privy Seal, the First Commissioner of the Treasury, the First Lord of the Admiralty, the Bishops of London and Durham, the two Principal Secretaries of State, the Master-General of the Ordnance, the Speaker of the House of Commons, the President of the Royal Society, the Surveyor-General of Woods and Forests, and the Surveyor of Crown Lands.

Ordinary Members (30).

The Dukes of Grafton, Bedford, Buccleugh; the Marquis of Bath; the Earls of Winchilsea, Hopetoun, Egremont, Lonsdale, Moira, Carysfort; Earl Fitzwilliam; the Bishop of Llandaff [Watson], Lords Hawke, Clive, and Sheffield; Sir Charles Morgan, Baronet; William Wyndham, Charles Marsham, William Pulteney, T. W. Coke, Thomas Powys, Henry Duncombe, Edward Loveden Loveden, John Southey Somerville, Robert Barclay, Robert Smith, George Sumner, John Conyers, Christopher Willoughby, and William Geary, Esquires.

The mode of election adopted by the Board was that of the ballot, and no resolution affecting the election of officers or the award of medals and premiums was arrived at in any other way. Thus, when on May 10, 1808, the Board had determined to present the gold medal to its Secretary, Arthur Young, for his lectures on tillage and the proper construction of farmyards, and for his long and faithful services to the cause of agriculture, each member present wrote Young's name on a slip of paper and deposited it in the ballot-box, before the unanimous award of the medal could be declared.



REDUCED FACSIMILE OF THE DIPLOMA ISSUED BY THE BOARD OF AGRICULTURE

The Charter gave power for the election of an unlimited number of Honorary Members, from whom it was contemplated that the Ordinary (*i.e.* the Executive) Members of the Board would be recruited from time to time. There are no statistics available as to the extent to which advantage was taken of this power; but in a list of the Members at the British Museum, dated 1796, the Honorary Members "elected by ballot" number 295, and in a later list of 1803 they number 443. In 1809, according to Ackermann's *Microcosm of London*, there were 500 Honorary Members.

Each of the members had a diploma, signed and sealed by the Board; and in order that there might be no doubt as to the significance of each part of the design, the following description of it was pasted at the back of the diploma:—

EXPLANATION OF THE DIPLOMA

Presented to its Members by the Board of Agriculture.

The landscape is intended to represent the view of a country, the greater part of which is already recovered from an unprofitable state into various and beneficial cultivation; the grounds immediately on the banks of the river are supposed to be rich meadows, rendered fertile by the judicious application of the water which passes through them; the foreground scene, extending to the hills, is principally occupied with the various branches of tillage: on one side of the river, cultivation is brought to perfection, and plantations, scattered everywhere, enrich the scene; on the other, the summit of the hill is uncultivated, but appropriated to pasture, and covered with sheep. The whole is designed to comprehend the leading objects of improved husbandry; the picture is supported by a male and female figure, representing the distinct characters of rural labours, with their respective attributes.

At the top there is a medallion of His Majesty, the Patron of the Institution. The sheep are marked on the one side with G. R., the royal mark; on the other, with the three feathers, denoting the particular attention paid by His Majesty, and by His Royal Highness the Prince of Wales, to that important branch of rural economy, the improvement of wool.

The seal of the Board (a patent calendar one) is appended, and, being made on a construction peculiarly ingenious, will specify the exact date when the diplomas are respectively signed, denoting that regularity and exactness so essentially necessary in all rural occupations.

The original seal referred to in the last paragraph—a handsome affair of gilt and ivory, and interesting as an early specimen of a moveable date-stamp—is now in the possession of the Royal Agricultural Society; and I have recently been fortunate enough to acquire the diploma of Arthur Young himself, a reproduction of which is given on the plate opposite this page.

OFFICERS OF THE BOARD.

The original officers of the Board as appointed by the Charter, were Sir John Sinclair, Bart., President; Sir John Call, [illegible]

Treasurer; and Arthur Young, Secretary. Sir John Call resigned the office of Treasurer in 1797. The succeeding Treasurers were John Grant (1797–1804) and George Smith (1804–1822), both Honorary Members of the Board. Of the first Under-Secretary we glean scarcely anything from the records, except that on one occasion he was thanked for an Address to the Board in six languages. He was, however, the celebrated traveller, critic and historical writer, John Talbot Dillon, who had sat in the Irish Parliament from 1776 to 1783. In 1782 he was created a Baron of the Holy Roman Empire, and received the Royal authority to bear the title in this country. In 1801, whilst still Under-Secretary of the Board, he was created a Baronet of the United Kingdom. He died in 1805, and the Board voted an amount equal to six months' salary to his widow, whom he left in embarrassed circumstances. Sir John Dillon was succeeded as Under-Secretary by William Cragg, who had been chief clerk to the Board since its establishment, and who died in 1821. One or two other clerks completed the Board's official establishment.

The offices of the President and Treasurer were honorary; the salary of the Secretary was fixed by Pitt, to whom Young applied for the appointment on May 20, 1793, at 400*l.* per annum. Young evidently was not quite satisfied with this, for, in his reply to Pitt accepting the post, he confesses it is less than he imagined would be assigned to the office; and in his *Autobiography*, given to the world for the first time in January of this year, he says: "When I found a very strict attendance attached to it, with no house to assemble in except Sir John Sinclair's, and in a room common to the clerks and all comers, I was much disposed to throw it up and go back in disgust to my farm; but the advice of others, and the apprehension of family reproaches, kept me to the annoyance of a situation not ameliorated till Sir John was turned out of the Presidentship by Mr. Pitt, and the Board procured a house for itself" (p. 219).

This is rather anticipating matters, but the quotation appears necessary to dispel the common notion that Sir John Sinclair and Arthur Young worked hand and glove in the organisation of the Board of Agriculture, and that both are equally responsible for its successes and its failures.

Sir John Sinclair's First Presidency, 1793–8.

It has already been mentioned that the first meeting of the Board, which Sir John Sinclair was anxious to convene as soon as possible after the Address to the King had been voted in the

House of Commons, had perforce to be delayed until September 4, 1793,[1] when Sir John delivered an address to the assembled members on the work before the Board. After this there was an adjournment until January 23, 1794, when the Board for the first time got to business. And this is how Arthur Young says they set about it:—

The Board of Agriculture, meeting in February [1794], arranged the President's plan for the attendance of their officers. By these laws all the officers of the Board were bound to attend, with no other exception than the months of August, September and October, with one month at Christmas and three weeks at Easter. These laws, ready cut and dried when the Board met, were adopted with no other alterations than such as the President himself had made in them previously to their being presented at the meeting. Lord Hawke had examined the rules and orders of many societies, and found that in all letters communications were addressed to the secretaries, and answers given by them. Sir John Sinclair struck this out, and directed all such communications to be to the President (himself), and for him also to sign all letters. This at once converted the Secretary into nothing more than a first clerk. I saw not at first the tendency of the alterations; but I soon felt their effect. All letters were dictated by the Secretary and written in a book; this book was altered and corrected at the will of the President, and such alterations made as in respect of agriculture were absurd enough; the whole done in such a manner as not to be very pleasing. (*Autobiography*, pp. 241 2)

The original letter-books thus referred to by Young came in some not clearly ascertained way (though probably with the Board's Library bought in 1844 from Mr. G. Webb Hall[2]) into the possession of the Royal Agricultural Society, and it is interesting to note the characteristic presidential touches given to the draft letters, though they usually consist of trivial alterations and of a little added pomposity to the phraseology.

In his inaugural Address to the Board, Sir John Sinclair laid chief stress upon the importance of at once instituting an agricultural survey of each county in the kingdom. There was not, indeed, much else than this in the Address, except that "the Board was already looked up to, even by foreign nations, as likely to become the general magazine of knowledge on agricultural subjects." Doubtless having in his mind the admitted success of his *Statistical Account of Scotland*, Sir John said:—

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[1] "I had occasion to make an excursion to Scotland after the motion was carried [May 15, 1793], but returned in June, full of expectation that in the space of a few days the Board might be assembled. Yet, though every possible exertion was made, the Charter was not drawn up, and ultimately sanctioned by the authority of the great Seal, till the 23rd of August; and it was on the 4th of September following before the Board could be assembled. In the course of that tiresome interval I was often on the brink of giving up the attempt; and nothing but a spirit of perseverance, which could not easily be damped, prevented me from relinquishing it." (*Communications to the Board of Agriculture*, vol i., 1797, p x)

[2] See Journal R. A. S. E., vol. v., 1844, appx p. xvii.

It would be necessary to examine into the agricultural state of all the different counties in the Kingdom, and to inquire into the means, which, in the opinion of intelligent men, were the most likely to promote either a general system of improvement or the advantage of particular districts. By employing a number of able men for that purpose, and circulating their reports previous to their being published, requesting the additional remarks and observations of those to whom such communications were sent, it was probable that no important fact, or even useful idea, would escape notice. The immense mass of information thus accumulated would answer two purposes: first, it would point out the measures which the Legislature might take for promoting agricultural improvements; secondly, individuals would thus be instructed by the practice and experience of others—the landlord in the proper mode of managing his property, and the farmer in the best plan of cultivating his fields. (*Communications*, vol. i., 1797, p. xxxii.)

During the recess, and without waiting for the formal approval of his colleagues, Sir John started the surveyors of some of the counties on their work, and the class of men he selected is best told in the words of Young:—

I was infinitely disgusted with the inconsiderate manner in which Sir John Sinclair appointed the persons who drew up the original reports, men being employed who scarcely knew the right end of a plough; and the President one day desired I would accompany him with one of these men, a half-pay officer out of employment, to call on Lord Moira to request his assistance in the Leicestershire Report, when this person told his Lordship that he was out of employment and should like a summer's excursion. To do him justice, he did not know anything of the matter. Still, however, he was appointed, and amused himself with his excursion to Leicester. But the most curious circumstance of effrontery was, that the greater number of the reporters were appointed, and actually travelled upon the business before the first meeting of the Board took place, under the most preposterous of all ideas—that of surveying the whole kingdom and printing the Reports in a single year—by which manœuvre Sir John thought he should establish a great reputation for himself. Consequently by his sole authority, who could not possibly know whether the Members of the Board would approve or not such a plan (*sic*). I was a capital idiot not to absent myself sufficiently to bring the matter to a question, and leave them to turn me out if they pleased. Mr. Pitt would probably have interfered and effected the object I wanted, and, if not, would have provided for me in a better way. (*Autobiography*, pp. 242–3.)

Financial Embarrassments of the Board.

It is pretty obvious from this frank statement that Sir John Sinclair had taken affairs a little too much into his own hands. As a matter of fact, he appears to have appointed most of the original surveyors himself, and without any clear understanding as to terms. When their bills came in, and the printers began to ask for money, the Board took alarm at the extent of their commitments. Even so early as March 25, 1794, the Finance Committee of the Board suggested "the propriety of the Board not entering into further engagements or contracting any new expense, except as to what relates to the

completion of the agricultural survey of the Kingdom and the printing of the reports, till the engagements already contracted shall have been discharged." A year after, on May 2, 1795, the Committee urged the Board "to pass an immediate resolution forbidding any expense whatever to be incurred, except for necessaries in the office, till the Board shall have received an exact account of their finances."

On May 11, 1795, and June 1, 1795, the Committee presented accounts showing 2,169*l.* due to printers, 498*l.* to engravers, and other liabilities which brought the total indebtedness of the Board up to 5,863*l.*, to meet which there was only 204*l.* in the Treasurer's hands, and the annual grant of 3,000*l.* to be received in the next September. The Committee observed on this occasion: "There is money due to many Surveyors for the writing and collecting the agricultural reports, but your Committee are not enabled from any of the papers or minutes to find out the precise terms on which those reports were to be collected and written." The Committee pointed out that this deficit and the indispensable office expenses of the next two years would practically exhaust the grants for 1796 and 1797, and they urged that "such orders and regulations may immediately be made, as may in future prevent the expenditure of the Board from exceeding its income."

The question of the financial position of the Board came again before the Committee on Expenditure on February 24, 1797, when it appeared that the Board had debts amounting to 3,531*l.* and could only count upon the receipt of 2,504*l.*, leaving a balance against the Board of 1,027*l.* At their next meeting on March 3, 1797, the Committee requested the President to draw up an account of the sums due by the Board, which had been authorised by the Board or by the Committee, and also a statement of such as had not been so authorised.

Sir John Sinclair handed in these statements on March 6, 1797, when it was resolved that "it is the opinion of this Committee that during the sittings of the Board no expenses whatever be incurred without the express authority of the Board, according to their former regulations determined on through this Committee, and that during the recess no greater latitude be given to the President than from 50*l.* to 100*l.*, according to the duration of the recess."

About this time, some of the Surveyors originally appointed by Sir John Sinclair without consulting his colleagues appear to have pressed their claims for remuneration; and there was a case drawn up for submission to counsel as to a demand made by Mr. Stone for certain reports, which demand was eventually

refused. On June 2, 1797, the Committee on Papers and Expenditure reported that "having taken into consideration the state of the funds of the Board and the unsatisfied demands due to a variety of persons, Resolved that from the present time until the meeting in November next there shall be no contract for printing any reports, memoirs, or other papers."

These financial details of a hundred years ago would not be interesting enough to print, were it not that they serve to disprove the commonly received notion that Sinclair's deposition from the Presidency in 1798 was a piece of political resentment by Pitt for Sinclair's opposition to him in the House of Commons, and was accomplished only by the complaisant votes of the *ex-officio* members.

It will be seen from what has been stated above that the whole of the Board's finances had been seriously crippled, and had got into a hopeless tangle, through the inconsiderate haste and unbusinesslike way in which the agricultural surveys had been organised. As the repeated protests of the Committee on Papers and Expenditure had had no real effect, it was necessary to have recourse to the more drastic method of appointing a new President, by way of preliminary to indispensable reforms. When Lord Somerville assumed the command, the Finance Committee were engaged for some months in examining old claims,—paying some, compromising others, and declining altogether to be responsible for the rest; and they passed resolutions stopping all printing (except the volume of "Communications") and all surveying "till the Board should be out of debt."

The Agricultural Surveys of Counties.

The fact is that Sinclair commenced on too ambitious a scale with the comparatively small funds at his disposal. Sir John's original estimate of the funds necessary for the Board's support had been 10,000 guineas per annum, which was reduced by degrees to 3,000*l.*, the actual sum annually voted by Parliament. But to a man of Sinclair's temperament, it was impossible to "hasten slowly," and therefore the initial efforts of the Board were directed with an impetuosity for which an annual income of 10,500*l.* would not have been excessive. By the middle of the ensuing year, 1794, the whole of the kingdom had been divided into districts and assigned to different "Surveyors," and by July 1795 nearly all their reports had been received. They were then issued as what Sinclair called "printed manuscripts," in quarto size, with large margins for the corrections and additions of practical agriculturists. The plan was not a bad one, but

it did not answer the expectations formed of it. This is not surprising when we consider the undue haste and bad judgment displayed by the President in the choice of the men employed.

The result was the production of a huge mass of ill-digested articles of the most varying degrees of merit, from valuable and exhaustive monographs in a few isolated instances to scrappy memoranda of but a few pages in others, according to the writers' ability and thoroughness, or lack of these qualities. Though ostensibly drawn up for private circulation, the reports were entered at Stationers' Hall, and may be regarded as practically published documents. The issue of such unreliable literature brought the Board at once into bad repute, and this unpopularity was accentuated by a belief, groundless it is true, that the inquiries of the surveyors were intended to lead to increased taxation. Another circumstance which added to the Board's difficulties was the hostility of the Church, provoked by an attempt to obtain information on the subject of tithes. Sinclair had derived much help from the Scottish clergy in the preparation of his Statistical Account of Scotland, and he now hoped to similarly enlist the co-operation of the English clergy. But the mention of the vexed question of tithes excited their suspicion, and even led to an intimation by the Archbishop of Canterbury to Pitt, that any interference with this matter would alienate the support of the Church from the Government.

In view of the fact that every now and then there appear in booksellers' catalogues what are described as "large paper" copies of the Reports to the Board of Agriculture on particular counties, it appears necessary to point out that these are the original imperfect drafts on quarto paper, circulated for correction amongst agriculturists of the district in the manner above described, and that the final reports were all printed (in most cases years after the original drafts and by different authors) in octavo size. The table on p. 16 shows for each county in England and Wales the dates of publication and the authors of these two sets of reports, which must not be confounded with each other.

I have had the reports on the Scotch counties tabulated in similar fashion, but it does not appear necessary to print the details in these pages, especially as the responsibility of the Board for some of the Scotch reports is not clear, and the early drafts and the final reports do not always relate to the same districts (*e.g.* there was a "draft" report by William Marshall on the Central Highlands, another by Sir John Sinclair on the Northern Counties, and a third by Thomas Johnston on Tweeddale, all printed in 1794–95, which never appeared in any

TABLE, *showing Authors and Dates of Publication of (A) the Draft (quarto) Reports, and (B) the Final (octavo) Reports, on the several Counties of England and Wales.*

—	(A) DRAFT (QUARTO) REPORT			(B) FINAL (OCTAVO) REPORT		
COUNTY	Author	Date	No. of pages	Author	Date	No. of pages
Bedford	Thomas Stone	1794	70	Thos. Batchelor	1808	651
Berkshire	Wm. Pearce	1794	74	Wm. Mavor	1808	559
Buckingham	Wm. James and Jacob Malcolm	1794	63	Rev. St. J. Priest	1810	420
Cambridge	Chas. Vancouver	1794	219	Rev. W. Gooch	1813	312
Cheshire	Thos. Wedge	1794	88	Henry Holland	1808	387
Cornwall	Robt. Fraser	1794	70	G. B. Worgan	1811	208
Cumberland	John Bailey and George Culley	1794	51	John Bailey and George Culley	1797	69
Derby	Thos. Brown	1794	72	John Farey (3 vols.)	1811–7	1901
Devon	Robt. Fraser	1794	75	Chas. Vancouver	1808	491
Dorset	John Claridge	1793	49	Wm. Stevenson	1812	498
Durham	Joseph Granger	1794	74	John Bailey	1810	426
Essex	Messrs. Griggs	1794	26	Arth. Young (2 vols.)	1807	873
"	Chas. Vancouver	1795	213			
Gloucester	George Turner	1794	57	Thos. Rudge	1807	416
Hampshire	Abr. and Wm. Driver	1794	78	Chas. Vancouver	1810	528
Hereford	John Clark	1794	79	John Duncumb	1805	181
Hertford	D. Walker	1795	86	Arthur Young	1804	255
Huntingdon	Thos. Stone	1793	47	R. Parkinson	1813	358
Kent	John Boys	1794	107	John Boys	1796	222
"	—	—	—	"	1805	306
Lancashire	John Holt	1794	114	John Holt	1795	253
				R. W. Dickson	1814	668
Leicester	John Monk	1794	75	Wm. Pitt	1809	420
Lincoln	Thos. Stone	1794	108	Arthur Young	1799	462
Middlesex	Thos. Baird	1793	31	J. Middleton	1798	614
"	Peter Foot	1794	92	"	1807	720
Monmouth	John Fox	1794	43	Chas. Hassall	1812	154
Norfolk	Nathaniel Kent	1794	56	Nathaniel Kent	1796	252
				Arthur Young	1804	552
Northampton	Jas. Donaldson	1794	87	W. Pitt	1809	332
Northumberland	John Bailey and George Culley	1794	70	John Bailey and George Culley	1797	168
"	—	—	—	" " (3rd ed.)	1805	213
Nottingham	Robert Lowe	1794	128	Robert Lowe	1798	201
Oxford	Richard Davis	1794	39	Arthur Young	1809	374
Rutland	John Crutchley	1794	34	R. Parkinson	1808	194
Shropshire	J. Bishton	1794	38	Joseph Plymley	1803	300
Somerset	J. Billingsley	1794	192	J. Billingsley	1797	336
Stafford	W. Pitt	1794	168	W. Pitt	1796	264
"	—	—	—	"	1813	347
Suffolk	Arthur Young	1794	92	Arthur Young	1797	320
"	—	—	—	" " (3rd ed.)	1804	447
Surrey	Wm. James and Jacob Malcolm	1794	95	Wm. Stevenson	1809	624
Sussex	Rev. A. Young	1793	97	Rev. A. Young	1808	479
Warwick	John Wedge	1794	60	Adam Murray	1813	201
Westmorland	Andrew Pringle	1794	55	Andrew Pringle	1797	79
"	—	—	—	" " (3rd ed.)	1813	87
Wiltshire	Thos. Davis, Sen.	1794	163	Thos. Davis, Jun.	1811	287
Worcester	W. T. Pomeroy	1794	94	W. Pitt	1810	448
Yorks, N. Riding	Mr. J. Tuke, Jun.	1794	123	John Tuke	1800	370
" E. "	Isaac Leatham	1794	68	H. E. Strickland	1812	310
" W. "	Rennie, Brown, and Shirreff	1794	140	Robert Brown	1799	436
North Wales	Geo. Kay	1794	119	Walter Davies	1813	526
Brecknock	John Clark	1794	55	"South Wales" Walter Davies	1814	1170
Cardigan	T. Lloyd and Turnor	1794	37			
Carmarthen	Chas. Hassall	1794	52			
Glamorgan	John Fox	1796	71			
Pembroke	Chas. Hassall	1794	63			
Radnor	John Clark	1794	41			
Isle of Man	Basil Quayle	1794	40	Thomas Quayle	1812	208
Channel Islands	—	—	—	Thomas Quayle	1815	305

other form). Speaking generally, nearly all the Scotch drafts appeared in 1793–94, but the complete reports—with very few exceptions—were not issued until the period of Sir John Sinclair's second presidency.

THE BOARD'S "COMMUNICATIONS."

Apparently in the hope of producing something more worthy of permanent preservation than what Lord Somerville subsequently called "voluminous detached publications," the Board had decided in 1796 to issue an annual volume of "Communications" after the pattern of the Philosophical Transactions of the Royal Society. The first we hear of these "Communications" is in the minutes of the Committee on Expenditure, dated April 29, 1796, when the Committee took counsel with Mr. Nicol, their bookseller, as to the sales of the Board's publications, which were not going off with the rapidity desired.

The Committee then expressed the opinion that the various important communications on different subjects which had been received by the Board, in particular, on farm buildings, cottages, and roads, and on foreign agriculture, might usefully be printed in a quarto volume. A Committee on Papers was appointed to go into this matter, and they drew up on May 24, 1796, a scheme of contents for the first volume. This was to be divided into four parts, Part I. of which (on Farm Buildings) Sir John Sinclair was to edit. The other three Parts of the book—II. (Cottages), III. (Roads), and IV. (Foreign Agriculture)—were to be under the control of other Members of the Board. The President was requested to "draw up preliminary observations, giving an account of the origin and progress of the Board of Agriculture," to be prefixed to this publication—a request which Sir John interpreted generously, since to his preliminary observations he annexed fourteen appendices (mostly of his own writing) which took up eighty-two printed pages. When this volume—originally published in 1797—was reprinted under another presidency in 1804, the preliminary matter was reduced to thirty-seven pages.

It may be mentioned here (though out of strictly chronological order) that, in all, seven volumes of these "Communications" appeared in quarto size, each volume consisting of from about 500 to 550 pages. The "Communications" included in these volumes were both practical and varied in character, and some of them were exhaustive treatises of great value. As they serve to reflect the general scope of the Board's operations, a reference to some of the subjects dealt with may be of interest. In

Vol. II. (1800) the various methods of enclosing and cultivating waste lands were practically discussed, and were accompanied by thirteen elaborate plates, giving eighty-one figures of different descriptions of fences, including quickset hedges, wooden palings, stone walls, ditches, and wire. Other articles in this volume dealt with irrigation, the effect of carriage wheels upon the roads, the curl in potatoes and the smut of wheat, merino sheep, the improvement of British wool, &c. Vol. III. of the "Communications" (1802) was devoted entirely to the memoirs on grass lands, to which I shall again refer.

The first part of the fourth volume (1805) consisted also of extracts from prize essays which had been sent in dealing with the same subject. The authors took a very wide range, and the extracts were classified under a variety of headings, such as soils, draining, paring and burning, manuring. fallowing, ploughing and rolling, courses of crops, oats, beans, turnips, cabbages, winter tares, potatoes, hemp, flax, woad, rape, grasses, and various other subjects. Then follow a collection of miscellaneous papers, prefaced by the speech made by Lord Carrington when quitting the chair on March 15, 1803, in which he gives an interesting account of the progress and "conduct" of the Board during the three years of his presidency. Other contributors to this volume were Sir John Sinclair, J. C. Curwen, and Sir Joseph Banks. The same three names also figure among the list of contributors to the first part of the fifth volume (1806)—a collection of short miscellaneous articles. The second part consists entirely of a dissertation on the merino sheep.

Vol. VI. (1808–10) contained some sixty-four articles on a great variety of subjects. Amongst the contributors were Watson, Bishop of Llandaff, on planting of waste lands; Warren Hastings, on naked barley; Coke of Holkham, on long dung; Sir Joseph Banks, on seed grass and merino sheep; and W. Amos, on agricultural machines, including the construction of a dynamometer. Vol. VII. (1811–13) was also miscellaneous in character, the most remarkable articles being a description of "Mr. Shepherd's machine for weighing live cattle," an essay on gates by Robert Salmon of Woburn,[1] and a paper by Lord Sheffield on the trade in wool and woollens.

This was the last of the quarto volumes. An attempt was made towards the end of the Board's career to start a new series of octavo size, the typography of which was modelled upon Sinclair's "Code of Agriculture." In 1819 was issued the first and only part of Vol. I. of this series. It was prepared for the press by the Under-Secretary, but it contained Arthur Young's final

[1] See "Agriculture and the House of Russell," Journal R A S E, vol ii., 1891, p 132

contribution to agricultural literature—a memoir on the cultivation of carrots, prepared in pursuance of an order of the Board dated May 18, 1813 A communication on the making and repairing of roads by the celebrated John Loudon McAdam was also included in this volume—the last publication of the Board.

Legislative Action of the Board, 1793–98.

Independently of the troubles which arose from Sir John Sinclair's too impetuous administration at the start, it must be admitted that during his first Presidency of 1793–98 much good work was done. The Board originated and carried through Parliament several useful agricultural measures. In 1795, its representations to Parliament resulted in an Act by which the weights and measures of the kingdom were placed under the summary jurisdiction of the magistrates, with the object of stopping frauds that were being practised upon the village poor. About the same time, the Board obtained the abolition of two imposts that were detrimental to agricultural interests. One of these was the duty on American oil cakes, the importation of which facilitated the fattening of oxen and the manuring of the soil The other was a tax on draining tiles that had operated greatly against the improvement of land.

An important feature of the Board's early work was the publication of Elkington's methods of draining. Joseph Elkington was a Warwickshire farmer, who first turned his attention to the subject in 1761, when he successfully drained some very wet land in his occupation that had rotted several hundred sheep. His system met with astonishing success when applied elsewhere, and his services as a drainer of land became much sought after. Like many other practical farmers of his day, he was incapable of giving an intelligible account of his system; and as he was in precarious health there was the danger of his discoveries being lost to posterity. On June 10, 1795, the House of Commons, on the motion of Sinclair as President of the Board, voted an Address to the Crown—

> That His Majesty would be graciously pleased to give directions to Mr Joseph Elkington, as an inducement to discover his mode of draining, such sum as His Majesty in his wisdom shall think proper, not exceeding the sum of 1,000*l* sterling, and to assure His Majesty that this House will make good the same to His Majesty.

Accordingly the sum of 1,000*l*. was duly awarded to the famous drainer, and the Board appointed a skilful land surveyor named John Johnstone to make himself master of Elkington's methods by observing them personally. The results were com-

municated in a treatise published by the Board of Agriculture, which ran through five editions.[1]

One of the Board's earliest and most immediately useful inquiries had for its object the relief of the pressure which was occasioned by the abnormally high price of provisions from about the years 1794 to 1796. Experiments in the making of bread with substitutes for wheat resulted in the public exhibition of bread of eighty different kinds. Amongst the substitutes employed were potatoes, rice, barley, oats, Indian corn, buck-wheat, peas and beans.

Lord Somerville's Presidency, 1798–1800.

In 1798, as already mentioned, the growing discontent at Sir John Sinclair's methods found (perhaps too) forcible expression in a manner described by Young in his *Autobiography*. Young had been asked by Pitt to go to his place at Holwood to talk about the drainage of some of the minister's land. He writes:—

> Lord Carrington taking me to Holwood, we walked about the place for some time before Mr. Pitt came down. When he arrived, ordering a luncheon, he said he had desired Lord C. to bring me, that he might understand what members of the Board of Agriculture were proper to fill the chair. I named Lord Egremont. "He has been applied to," rejoined Mr. Pitt, "and declined it." I then mentioned Lord Winchilsea; the same answer was returned. I named one or two more, but the minister seemed not to relish their appointment. I next said Lord Somerville, who was famous for the attention he had paid to some branches of husbandry. Mr. Pitt's reply was, "He is not quite the thing, but I doubt we must have him," and the conversation concluded with an apparent determination that Lord S. should be the man. He was accordingly elected, and I, the same day, received the orders of the Board instantly to look out for a house [2] (because Sir John S. being turned out would no longer volunteer his), which I accordingly did, and fixed upon one in Sackville Street, into which the Board immediately removed their property, and appointed the Secretary to reside in the house, with an allowance of one hundred guineas a year for paying the porter, keeping a maid in the house in summer, and finding coals and candles. (*Autobiography*, pp. 315–6.)

The original Minute Books of the Board show that on March 23, 1798, thirteen votes were cast under the ballot for

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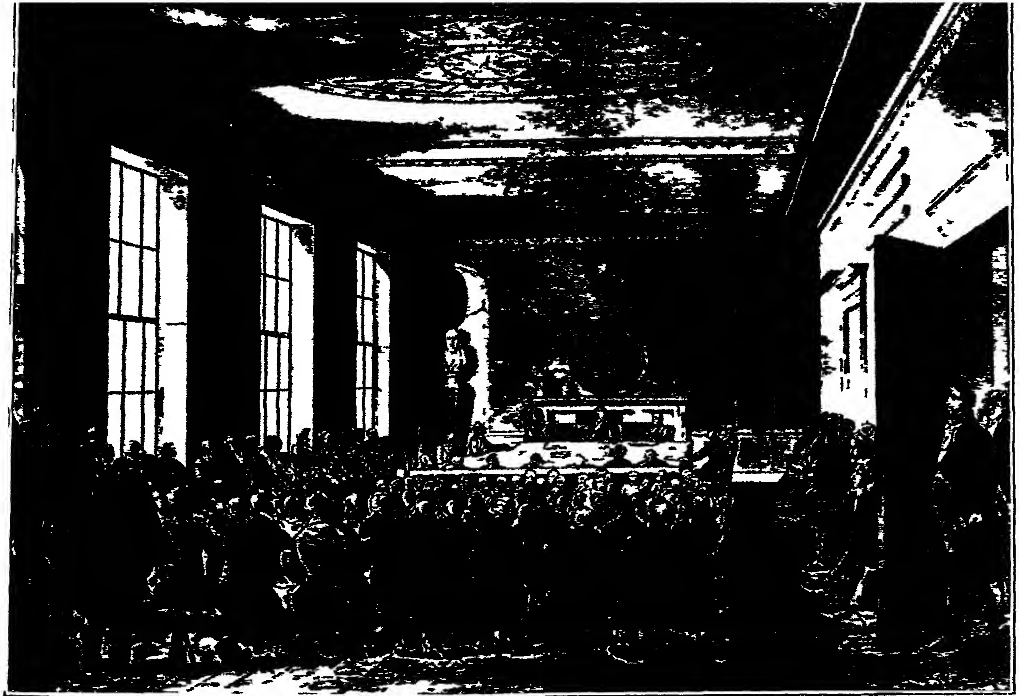
[1] *An Account of the Mode of Draining Land according to the System practised by Mr. Joseph Elkington*, 1797.

[2] This was not a sudden resolve in view of the change of presidency. A year before, on March 3, 1797, the Committee on Expenditure had recommended the Board "to give directions that a house be looked out for the meetings of the Board and the residence of the Secretary, in order that the Board may not continue to be such a burthen on the zeal of the President as they have hitherto been." And at the next meeting, on March 6, 1797, the Committee recommended that the thanks of the Board "be given to the President for his having offered the use of his house for another year, and that this offer be accepted; but that in the meantime a house for future use should be looked out for."



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MEETING POOM OF THE BOARD OF AGRICULTURE AT 32 SACKVILLE STREET

From Ackermann s Microco-m of London 18

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Lord Somerville and twelve for Sinclair, and on May 8[1] the Board held its first meeting in its new quarters at 32 Sackville Street, and expressed its approval of what the new President had meanwhile done in hiring the house.

One of the illustrations of Ackermann's *Microcosm of London*, published in 1809, is an engraving by Rowlandson of a meeting of what is described in the text as "The Society of Agriculture" in the "great room" at 32 Sackville Street; and a reproduction of this is given in the plate opposite. The room still exists, with the same ceiling decoration; but it is not so vast or lofty as is depicted by the famous caricaturist.

In the "Dissertations" with which he prefaced the publication of his first Presidential Address to the Board, delivered on May 8, 1798, Somerville[2] states that "to produce all the required effect such an institution must be closely followed up by men well grounded in the science, who have the means of detecting and separating that which is useful from that which is visionary; who have grafted theory on approved practice." He declares that his object as President of the Board of Agriculture was to regain the confidence of agriculturists, which it had lost, and he ascribes the Board's unpopularity to the "numberless plans of inquisitorial research into the resources of the kingdom which have by the ignorant and suspicious been falsely attributed to Government through the channel of the Board."

Whatever may have been the political motives by which Pitt and his colleagues were actuated, it is certain that the financial position of the Board made a change of policy and administration highly desirable for the sake of its interests. From statements handed in by the outgoing President it appeared that the Board's acknowledged liabilities exceeded its assets by nearly 420*l.*, and that this sum would have to be deducted from the 1798 Parliamentary grant of 3,000*l.* But, in addition to this deficit, Sinclair had submitted a "Statement of Probable Expenses," amounting to 1,692*l.*, to fall due for what Somerville called "those speculative engagements hinted at by the late President." Somerville's power for immediate reform was therefore seriously handicapped by the crippled state of the funds. As a practical man, however, he sketched out a plan in his address for setting the Board upon a sounder financial basis. He proposed the liquidation of the debt in five

[1] Another resolution of the Board of this date is historically interesting:—"Ordered that the Board do adjourn *sine die* in case of the enemy landing, or the danger of invasion being such as to induce Government to call out the Volunteer corps, many members of the Board and its officers being engaged in these corps."

[2] *The System followed during the Last Two Years by the Board of Agriculture*, by John, Lord Somerville, 2nd ed. (1800), pp. 8 and 9.

years by setting aside the annual sum of 400*l.* out of the grant, and the stoppage of all printing, with the exception of the yearly quarto volume of "Communications," which was to take the place of the expensive "voluminous detached publications" previously issued.

Calculating that by the saving of printing 1,000*l.* would be annually available, Somerville suggested the offer of premiums of 50*l.* or 100*l.* each "for discoveries and improvements in the most important and leading points of husbandry," and the establishment, when funds permitted, of a tillage or convertible farm, "to hold out as an example to the nation the most vigorous system of modern substantial improvements in husbandry.' These suggestions were adopted by the Board on May 25 and 29, 1798.

On March 19, 1799, Somerville was unanimously re-elected President at a fully attended general meeting of the Board, and on May 14 of that year he delivered his third and final address, with "Sheep and Wool" for his subject.[1] Soon after this his health gave way, and his attendances at the meetings of the Board ceased for a considerable period, his last appearance in the capacity of President being on June 25, 1799. Presumably from this cause, the meetings of the Board ceased too, and it was not until January 21, 1800, that a quorum was again formed. Under these circumstances, and owing to Somerville's departure in 1799 for Portugal, in the double quest of health and agricultural information, the Board at the next annual meeting, on March 25, 1800, elected a new President, Lord Carrington, who obtained eleven votes against five for Lord Somerville and four for Sir John Sinclair.

System of Annual Premiums.

Under Lord Somerville's direction the financial position of the Board was greatly improved, as was acknowledged by his successor, an eminent financier. His two principal suggestions, the offer of annual premiums, and the establishment of an experimental farm, were both carried out, in what manner may next be described. The Board's annual premiums or prizes, as we should now call them, for the best essays on given subjects relating to agriculture, were commenced on May 29, 1798. Arthur Young was favourable to the idea, although he contended that the small amounts offered greatly lessened their usefulness. The Board's minute on this subject shows the sensitiveness with which they regarded their outside unpopularity at this time, for in it they "pledge themselves to the public that

[1] *The System followed during the Last Two Years by the Board of Agriculture*, by John, Lord Somerville, 2nd ed (1800), pp. 42 *et seq*

they mean within a convenient period to make various offers of such magnitude as may be highly conducive to the encouragement of the national agriculture." Accordingly, premiums to the number of twenty-three were first offered by the Board for competition in the year 1800, and they are sufficiently suggestive of the state of agriculture at the time to be summarised here—

1. Most practical plan for ameliorating the condition of the labouring poor. Gold Medal.

2. To the person who shall build on his estate the most cottages for labouring families, and assign to each a proper portion of land for the support of not less than a cow, a hog, and a sufficient garden. G.M.[1]

3. Account of the best means of supporting cows on poor land in a method applicable to cottagers, verified by experiments. G.M.

4. Experiments in the improvement of various cereals, leguminous plants and roots. G.M.

5. Memoir on the means of obviating objections to a General Enclosure Act. G.M.

6. Means of preventing future scarcities. G.M.

7. Building and description of cheap cottages. G.M.

8. Invention of substitute for leather in the shoes of labouring poor. G.M.

9. To persons who shall, through the entire summer of 1800, keep the greatest number of cattle in stalls, houses, or confined yards, and fed entirely in the soiling method with green food. G.M.

10. To the person who shall improve, and bring to the annual value of not less than 10*s.*, the greatest number of acres heretofore waste, not less than fifty. G.M.

11. Most satisfactory account of one of Mr. Elkington's drainages. Silver Medal.

12. Experiments to ascertain the comparative advantages and disadvantages of folding sheep. G.M.

13. For the irrigation of the greatest number of acres in a country where irrigation is not generally practised. G.M.

14. Experiments on the comparison of horses and oxen in the general business of a farm. G.M.

15. Most satisfactory account of the houses, and the past and present population of a district of not less than ten contiguous parishes. S.M.[2]

16. Experiments on the effect of ploughing in green crops for manure G.M.

17. Experiments during four years of the cultivation of not less than five acres with potatoes and wheat in constant succession. G.M.

18. Most satisfactory account of the nature of manures and the principles of vegetation. G.M.

19. Most satisfactory account of the application and effect of manures verified by practical experiments. G.M.

20. Paper on the means of ascertaining the probable state of the weather, so as to furnish useful information to the husbandman. S.M.

21. Account, with drawings, of the various instruments of husbandry. G.M.

22. For the person who shall consent to his tenant applying the greatest quantity of old pasture-land for the cultivation of early potatoes. G.M.

23. Best means of rendering general the practice of Rutlandshire and Lincolnshire in letting land for one or two cows to the labouring poor, with a sufficiency of potatoes. G.M.

These premiums were repeated, with variations, from year to

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[1] Gold medal. [2] Silver medal.

year. As will be seen, they appealed largely to the landowning classes, and consisting of gold and silver medals, they were intended as honorary distinctions rather than as monetary rewards of a fixed value. The publication of the premiums was effected by sending copies to the High Sheriffs for the use of the Grand Juries, and by posting upon the doors of the churches and chapels throughout the Kingdom. Premiums, more or less upon the lines originally laid down, continued to be offered annually by the Board during the remainder of its existence. In the later years, they consisted of monetary rewards of vary-

Medal of the Board of Agriculture
Obverse and Reverse

ing amounts up to 100 guineas, with or without the Board's gold or silver medal.

Experimental Farm.

The idea of establishing an experimental farm was approved on May 29, 1798, when inquiries were made for suitable land. When, however, Lord Carrington became President, he offered to allow the Board to make experiments on his estate at Wycombe, Bucks; and Sir Christopher Geary, another Ordinary Member of the Board, made a similar offer of land near Croydon. The question, therefore, of the Board acquiring a farm of its own was for a time abandoned. It was revived in 1802, and six acres of land at Salisbury's Botanical Garden, Brompton, were taken for the purpose of agricultural experiments. The rent of this land was 10*l.* per acre exclusive of rates and taxes. The poor rate was about 2*l.*, and the tithes 7*s.* per acre. Arthur Young in his Diary characterises this action as "stark staring folly." He complains that he was not consulted previous to the arrangements, which were made by the President and two other members. When directed to draw up a plan of experiments,

he did so, "without corn, for myriads of sparrows from nurseries would eat all up." [1] A sub-committee, consisting of the President, the Surveyor-General of Crown Lands, and the Rev. H. B. Dudley, was appointed to direct the experiments, the practical arrangements for which were undertaken by the owner of the land, Mr. Salisbury. These experiments were soon abandoned, and the land given up. Three years later, agricultural experiments were resumed on four acres of land at Knightsbridge, which were offered for the purpose by Mr. Edward Loveden Loveden, an Ordinary Member of the Board.

Lord Carrington's Presidency, 1800–1803.

The Board's third President was the first Lord Carrington, who as Robert Smith was one of the original Ordinary Members. The warm friend and supporter of Pitt, he was certainly one of the ablest men who occupied the Presidential chair. On his resignation in 1803, he received a special vote of thanks from the Board for his services, particularly with regard to his judicious management of the funds. These he left in a very satisfactory state, with a credit balance of upwards of 3,300*l.*

To students of economic history, the exceeding scarcity of food with which the nineteenth century opened is well known. With a view of learning the extent of the scarcity and of suggesting remedial measures, letters were sent by the Board in the spring of 1800 to all parts of the country asking for information as to the stocks of corn then in the country, and as to the general expectation of the yield of the ensuing harvest. The replies received indicated so serious a state of things that the Board with admirable foresight urged the Government in repeated representations to import rice from India.

Owing to difficulties of negotiation with the East India Company, delays, and procrastinations, nothing was done to give effect to the Board's recommendation until August 28, 1800, when the necessary letters to India were despatched, too late, however, to be of service. On October 2, 1800, the rice bounty expired, and was not renewed until the meeting of Parliament, which was specially summoned for an autumn sitting to deal with the serious crisis occasioned by the dearth.

But it was not until after an abundant harvest in the year 1801 that 1,900 tons of rice from India actually reached these shores. It was then a mere drug in the market, and cost the country a sum of 350,000*l.* to discharge the Parliamentary guarantee to the importers.[2] Had the Board's representations

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[1] *Autobiography*, p. 379.

[2] See Lord Carrington's Address to the Board, *Communications*, vol. iv, 1805, p. 233.

been acted upon with reasonable promptitude, the rice would have arrived at the critical period, it would have been sold at high prices, and the necessity for the purchase of a proportionate amount of foreign corn would have been obviated. According to Young's estimate the sum of 2,500,000*l.* would have been saved had the Board's proposals been adopted in time.[1]

Essays on Grass Lands.

Meanwhile the price of wheat rose to 118*s.* per quarter, and the scarcity of provisions became more and more acute. A vast number of expedients to relieve the distress were put forth on all sides, and the subject engaged the anxious attention of both Houses of the Legislature. On December 16, 1800, a requisition was received from a Select Committee of the House of Lords on the Dearth of Provisions, of which Lord Carrington, the President of the Board, was Chairman, asking the Board "to examine into and report upon the best means of converting certain portions of grass lands into tillage, without exhausting the soil, and of returning the same to grass after a certain period in an improved state or at least without injury."

A Special Committee was appointed to consider this requisition, and their deliberations resulted in the Board's decision of December 17, 1800, to offer premiums amounting to 400*l.*, and consisting of a first premium of 200*l.*, a second of 100*l.*, a third of 60*l.*, and a fourth of 40*l.*, for the best essays on the subject, based on "actual experiments, accurate observation, or well-authenticated information."

An elaborate scheme, showing the scope of the essays required, was drawn up, and comprised such points as varieties of soil, length of time under tillage, drainage, paring, burning, depth of ploughing, cropping, feeding on the land or carting off of produce, grass-seeds for re-sowing, manuring, adjustment of rent, &c.

The announcement of the premiums brought forth no less than 350 essays, and their examination occupied the Board during the ensuing session of 1801. The plan of examination adopted was to appoint fourteen Ordinary Members of the Board, each of whom, with the assistance of four Honorary Members, was expected to read and report upon 25 essays, the names of the writers being of course retained in sealed envelopes until after adjudication. As an instance of the zeal which animated the members of the Board, it may be mentioned that the famous Francis, fifth Duke of Bedford, who was one of the fourteen members selected to examine the essays, read not

[1] Young's Lecture of May 26, 1809, "On the Advantages which have Resulted from the Establishment of the Board of Agriculture," p. 31.

less than forty of them "during the vacation"—a holiday task that few in these days would care to undertake. Moreover, through the influence of the Duke, Parliament was persuaded to vote towards the cost of the inquiry a sum of 800*l.*, which enabled the Board to give a large number of additional rewards to the more meritorious of the essays, that were unsuccessful in obtaining either of the four principal premiums. These additional rewards comprised four of the value of 25 guineas each, eight of the value of 15 guineas each, eight of the value of 10 guineas each, and sixteen of the value of 5 guineas each, and the Board's Silver Medal was also given to many of the other competitors whose essays were approved.

The premiums of 25 and 15 guineas were exchangeable for the Gold Medal at the Board's discretion, and most of the prizes given were in the form of plate. The four chief premiums were gained by the Rev. H. J. Close, of Hordle, Lymington; Mr. Thomas Davis, of Longleat; the Rev. Arthur Young, son of the Secretary; and the Rev. Edmund Cartwright, of Marylebone Park, in the order named. Their essays, preceded by several articles on the subject by non-competitors, were published in Volume III. of the Board's "Communications," together with the more meritorious of the remaining contributions approved by the Board. This volume of the "Communications," which was published in 1802, was inscribed to the memory of Francis, Duke of Bedford, whose death on March 2, 1802, at the early age of 36, was so greatly regretted by contemporary agriculturists.[1]

A general Report, based upon the information contained in these essays, was adopted by the Board, for presentation to the Lords' Committee on June 19, 1801, and as it is remarkable for its good sense and sound judgment, the substance of it may well be reproduced. I have not been able to find a printed copy of this Report, which, however, with its Appendix, appears in the minute-book. It states that no high price of corn or temporary distress would justify the ploughing-up of old meadows on the marshes or rich pastures which fatten cattle, and that on certain soils well adapted to grass, age improves the quality of the pasture to a degree which no system of management on lands broken up and laid down again can equal. Various sheep lands known as "ewe-leases" of great fertility, the downs of different counties, and dairying districts are also specially recommended for preservation in grass. The lands named as suitable to be ploughed up comprise heaths, wastes, sandy commons, sheep-walks, downs of inferior herbage, hide-

[1] See Journal R A S E, vol ii (1891), p 1 3

bound and mossy pastures, "great tracts of convertible land covered with anthills," ordinary grass lands laid down in bad order which may be profitably ploughed and re-sown with better sorts of grass seeds, and in general, all dry or moderately moist lands, not yielding rent equal to that of adjoining arable land. The Board also enumerate some of the chief obstacles to conversion of grass lands, such as fluctuation in the price of wheat, to be remedied by alteration in the corn laws; tithes, which were considered a powerful impediment to the culture of corn; the increase in the poor rates; and waste lands.

In the Appendix the Board discuss the kind of husbandry desirable for the proposed conversion of grass to arable land, and its eventual re-conversion to grass land. They express the view that the paring and burning of all coarse waste, hide-bound, mossy and boggy soils is highly beneficial, provided the course of cropping be carefully regulated, but that on other soils there is so much difference of opinion and practice that they cannot hazard a positive recommendation. It may be interesting to quote the Board's suggestions as to the seeds which should be employed when re-laying down the land. The Appendix stated:—

> In respect of the seeds to be used from 6 lb. to 10 lb. of white clover should on all soils be allowed in addition to the quantity of native grasses (properly so called) that can be procured. Of these the best are Meadow Fescue, Meadow Foxtail, Meadow Poa [now called Smooth Stalked Meadow Grass], Crested Dog's-tail.

Whilst throwing much light upon an imperfectly understood subject, probably the best effect of the inquiry was negative in character. It prevented the indiscriminate conversion of old pastures into arable land for the sake of a merely temporary gain. Such a conversion would have utterly ruined some of the finest pastures in the world, and entailed upon this country a disaster of the gravest kind. As it was, there is reason to believe that many of the grass lands which were broken up at this time were never laid down again according to the original intention; and thus much of the land to-day under the plough is ill-fitted for the growth of cereals. The process of laying down arable land to permanent pasture which has been going on so steadily during recent years, owing to the fall in the price of grain, is therefore in many cases only reversion to a system of cultivation for which the soil is more naturally suited.

A similar requisition from the House of Commons Committee on the Dearth of Provisions desired the Board to consider the question as to "whether any and what premium on the

cultivation of early potatoes would be likely to be attended with beneficial effects." The Board, in reply, recommended Parliament to offer premiums to the amount of 15,780*l*. for the cultivation of ordinary potatoes on land not in tillage during the seven previous years. They considered that no loss would ensue to the public by the offer of premiums to this amount, since the slightest fall in the price of potatoes, brought about by their more extended cultivation, would, to quote from the Board's report, "relieve the classes most in want to a much greater amount than the value of the premiums expended can burthen others." In other words, the reduction of the poor rates would amount to much more than represented by the general taxation necessary to produce 15,780*l*. The Board's recommendation was adopted by the House of Commons Committee, but never given effect to by Parliament.

Enclosure of Waste Lands.

Great exertions were made by the Board to bring about the general enclosure and cultivation of the waste lands of the Kingdom. These consisted, according to the Board's own estimates, of not less than 22,107,001 acres, of which 6,259,470 acres were in England, 1,629,307 acres in Wales, and 14,218,224 acres in Scotland.[1]

The enclosure of these enormous wastes was looked upon as the panacea for the prevailing distress, and as the only means of rendering the country independent of foreign supplies. Each enclosure, however, required a separate Act of Parliament, and the legal costs of obtaining it were to a large extent prohibitive. The opinion of the Board on the subject is emphatically laid down in the following extract from the Report on Grass Lands to the House of Lords Committee, to which reference has already been made:—

> Another, and a great obstacle to tillage, and which is the subject of universal complaint, is the immense quantity of waste land found in almost every part of the Kingdom, considerable tracts of which are naturally fertile, but from entire neglect, want of draining and other improvements, are in a state nearly unproductive. On a subject which is now under the consideration of Parliament, the Board conceive it unnecessary to do more than to give it as their decided opinion that all waste land should be brought into cultivation as soon as may be, and that every impediment to such cultivation should be removed by the wisdom of Parliament. It is also submitted that an adequate commutation in lieu of tithe of such land is indispensably necessary to the success of this most desirable object.

A General Enclosure Bill was prepared by the Board of

[1] *General Report on Enclosures*, 1808, pp. 2 and 141.

Agriculture and passed by the House of Commons in 1798, but was thrown out on the motion for the second reading in the House of Lords, chiefly by the influence of Lord Chancellor Rosslyn, the same who, when Lord Loughborough, had affixed the Great Seal to the Board's Charter in 1793. The Board, however, persevered, and when, early in 1800, they were engaged in the inquiry which resulted in their suggested importation of Indian rice, they received fresh encouragement from a series of resolutions by the Grand Jury of the County of York. These, after pointing out the recent great fluctuations in the price of corn and the insufficiency of the produce of the country for its consumption, urged the consequent necessity of converting to productive husbandry the immense tracts of uncultivated wastes. With a view of strengthening the position they had taken up on this matter, the Board transmitted the Yorkshire resolutions to the High Sheriffs of the other counties, in order to obtain an expression of opinion from their respective Grand Juries at the Summer Assizes of 1800. The replies received were confirmatory of the views expressed by the Yorkshire Grand Jury; and on November 25, 1800, the Board passed a further resolution expressing the opinion that a general enclosure of waste and uncultivated land ought, from the circumstances of the times, to be immediately resorted to, and that the obstructions to such enclosures ought to be removed by Parliamentary provisions.

Following upon this resolution, the Board's President, Lord Carrington, as Chairman of the Committee on the Dearth of Provisions, introduced into the House of Lords, in the spring of 1801, a new General Enclosure Bill, different from that of Sinclair. It met with no better fate, and immediately evoked a storm of opposition, especially from the legal peers, accompanied by a violent attack upon the Board of Agriculture itself. At the end of the Resolutions of the Yorkshire Grand Jury was an observation "that the practice of taking tithe in kind was an obstacle to the improvement of agriculture," and that there should be a "fair and just commutation." This renewed reference to a highly controversial subject was unfortunate. It prevented the bill from being discussed upon its merits. In vain Lord Carrington protested that the propriety of tithes had never been questioned. The Board was accused of attacking tithes under the pretence of enclosing waste lands, and of a general conspiracy against the Church of England. The fact that Lord Carrington was a Nonconformist added point to the accusation. The bill—framed to deal with large commons, the rights to which were vested in different parishes, and the numerous commons where the quantity of land was too small

to bear the expense of separate Acts—was read a second time, but in Committee its leading provisions were so altered as to render its author as anxious for its withdrawal as were his opponents. This bill had also passed the House of Commons. Lord Carrington when referring to this subject in his Address to the Board on March 15, 1803,[1] concludes:—

> If, after the fatal experience of more than twenty million sterling having been sent to foreign countries for the purchase of grain within the short period of a very few years, they can shut their eyes upon the past and consider the present abundance as perpetual; if they can still condemn millions of acres, which are capable of every kind of produce, to remain dreary wastes, I can impute it to little less than a species of infatuation. The case seems to me desperate; and I may almost say of them, in the forcible language of Scripture, "Neither will they be persuaded though one rose from the dead."

Though these well-intentioned efforts to obtain a General Enclosure Act were thus frustrated, the Board subsequently in the same year (1801) had the satisfaction of passing through both Houses a smaller Act which cheapened and facilitated the process of enclosure. How great an influence the Board, notwithstanding the opposition to it, managed to exercise in the direction of enclosing waste lands may be gathered from the circumstance, stated by Arthur Young, that in the sixteen years preceding the Board's establishment the number of Enclosure Acts was only 509, whereas from 1793 to 1808 it was 1052.[2] And to the fact that the Board was but in advance of its times with regard to both enclosures and tithes, the General Enclosure Acts of 1836, 1845 and 1852, and the Tithes Commutation Act of 1836 bear witness.

Lectures on Agricultural Chemistry.

Another important matter to which the Board at this time turned its attention was the organisation of lectures on Agricultural Chemistry, to which it is not too much to say that agriculturists of later times will always owe a debt of gratitude.

On May 25, 1802, the Board referred to their General Committee the question as to whether any and what means should be taken to procure a series of lectures on the application of chemistry to agriculture, either in the Board-room or at the Royal Institution, where a laboratory and chemical apparatus were available. Negotiations with the managers of the Royal Institution, conducted through Sir Joseph Banks, resulted in the engagement of Professor Davy, afterwards the celebrated Sir Humphry Davy, who was then Professor of Chemistry at the Institution, to deliver there in May 1803 a

[1] *Communications*, vol iv. (1805), p. 241

[2] Young's Lecture of May 26, 1809, p. 16.

series of six lectures on Agricultural Chemistry to the members of the Board.

On May 31, 1803, the Board fixed Professor Davy's remuneration for these lectures, which had given the greatest satisfaction, at ten guineas each, and they appointed him as "Professor of Chemical Agriculture" to the Board, with a salary of 100*l*. per annum. He was elected an Honorary Member at the same time. The duties of the new Professor were to give annual lectures on the application of chemistry to agriculture, and to analyse such substances as should be referred to him by the Board, if he considered such analyses likely to throw light upon the theory or practice of agriculture. The analyses were to be conducted with sufficient accuracy for the purposes they were intended to answer, though it was not expected that the "precision necessary for the illustration of philosophical researches should be attempted in them." The Committee further reported:—

> That it is also necessary the Board be aware that the science of Agricultural Chemistry is at present in its infancy, and that until it is more matured each analysis will take up a considerable portion of the time Mr. Davy can set aside from the duties of his prior engagements; they may, however, after the encouragement they have given to the science, be fairly allowed to hope that it will not be long before Mr. Davy, with proper assistants under his superintendence, will be able to undertake the business of analysing soil, manures, &c., for individuals wishing to consult him, at a moderate fixed price to be paid for the analysis of each substance that shall be put into his hands.

Here, therefore, we have the earliest indication of that policy, continued by the Royal Agricultural Society, of the application of chemical science to practical agriculture, which in the hands of successive Consulting Chemists to the Society has borne such excellent fruit in chemical discoveries affecting agriculture, and in analyses of manures and feeding stuffs, for the protection of agriculturists from fraud.

Sir Humphry Davy—whose name is familiar as the inventor of the miner's safety lamp—may be regarded by agriculturists as the Father of Agricultural Chemistry, and as the professional ancestor of every agricultural chemist. The lectures which Professor Davy annually delivered for ten years before the Board were published in 1813. Lectures on other agricultural subjects were also organised by the Board, and in 1808 Arthur Young gave what he believed to be the first agricultural lecture ever delivered, the subject being "Tillage." (It may be mentioned that agricultural lectures followed by discussions were a prominent feature at the weekly council meetings of the Royal Agricultural Society in its early days. They were abandoned in 1867.)

LATER PRESIDENTS: LORD SHEFFIELD, SIR JOHN SINCLAIR, EARL OF HARDWICKE, EARL OF MACCLESFIELD

From 1803 to 1806 the presidency of the Board was held by Lord Sheffield,[1] also an original Ordinary Member. He is best known as the friend and executor of Gibbon, and as the compiler of the great historian's Memoirs He was an ardent agriculturist, and the author of several pamphlets on corn, wool, and American commerce.

Lord Sheffield having determined to retire, Sir John Sinclair again came forward as a candidate for the presidency, much to the chagrin of Arthur Young, who makes the following entry in his Diary: "Nothing but bad news. Sir J. Banks writes me, that Sir J Sinclair is to resume the chair of the Board under promises of good behaviour"[2] Sinclair was elected at the annual meeting of March 25, 1806, when, in the balloting, 20 votes were given for him as against 10 for Lord Sheffield, the retiring President. On this occasion, as when Sinclair was ousted in 1798, there was a very full attendance of the Board, including nine of the Official Members. On April 22, 1806, Sinclair delivered a long and eloquent address to the Board, over which he says he had watched "with a species of paternal solicitude," setting forth what had been accomplished in the past, and what objects should engage the Board's future attention. In this address, he referred to the unanimity which had characterised the proceedings of the Board, and added: "The same noble and generous line of conduct, I trust, will ever be pursued by those respectable characters to whom I have now the honour of addressing myself." At the same time he reassured his auditors as to financial matters in the following words:

> It is impossible to carry great measures with the present income of the Board It was attempted at the commencement of this Institution, but it obtained so much obloquy that it must never again be repeated, at least while I have any concern in the direction. I trust, however, that there is no occasion for any alarm on this head.

With a balance to the credit of the Board's funds of only 81*l.* 4*s.* 4*d.*, and with no prospect of receiving the current year's grant of 3,000*l.* until the following December, Sinclair proceeded to enumerate thirteen objects to which the Board's attention might be directed. I will briefly allude to those which are likely to prove interesting to readers of the present article: at any rate they serve to show how prolific were the

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[1] For interesting details with regard to many of the personages mentioned in this article, see *The Girlhood of Maria Josepha Holroyd*, London, 1897. (Miss Holroyd was Lord Sheffield's daughter)

[2] *Autobiography*, p 413

President's ideas. He suggested, for instance, as a subject for the Board's future consideration the holding near London of Agricultural Meetings on the lines which had been so successfully adopted by the Duke of Bedford and Coke of Holkham. With regard to the improvement of live stock, he considered that "it was impossible to say to what degree of perfection this great branch of husbandry would soon be brought." He suggested that attention should be paid to the improvement of cereals and other produce by applying the principle of selection, as in the case of the breeding of live stock. He advocated the formation of a "Joint Stock Farming Society" with a capital of a million pounds, for the purpose of advancing money to enable landowners to promote agricultural improvements.

Reference was also made to the value of the county reports in making available for the whole kingdom valuable points of farming practice peculiar to one district or even one farm. Thus, for instance, a practice was discovered in Suffolk of putting in spring corn and other crops without spring ploughing, the land having been prepared in the previous autumn. This plan effected a saving equal to the rent of the land, while the crop was surer and the yield 30 per cent. more abundant. Another practical expedient, thus communicated, was the feeding of carrot-tops to dairy cows. The tops were cut twice, viz., in July and September, "with advantage rather than detriment to the root," and it was said that an acre of such cuttings would support a cow of moderate size for about four months, yielding milk of superior quality. Finally Sinclair called attention to "Agricultural Education and Experimental Farming," and to the establishment at some future period of "one or more experimental farms," and the institution at each of them of "a sort of academy or college where our youth might be instructed in the theory as well as trained to the practice of agriculture."

Sinclair's second term of Presidency of the Board, which extended over seven years, was mainly devoted to the project of completing the agricultural surveys in their corrected form. Of these about twenty-five had been published, leaving upwards of fifty still to be executed at an estimated cost of 6,700*l.* Before his final retirement, in 1813, Sinclair had the satisfaction of publishing, with one or two exceptions, the whole of the remaining reports. Additional grants, amounting in all to 8,500*l.*, which, through the influence of his friend, the unfortunate Perceval, who became Prime Minister in 1809, he succeeded in obtaining from the Treasury during the years 1809 to 1812, materially contributed to this result. But the *magnum opus*

with which Sinclair hoped to crown his labours in connection with the agricultural surveys was unfortunately never to be accomplished. His intention, often repeated, was to compile a general report for the whole kingdom based upon the information in the reports of the several counties, a work in which "every sentence should contain the essence of a paragraph, every paragraph of a section, every section of a chapter, and every chapter of a volume."[1]

The county reports, in their final form, undeniably constitute a body of information of extraordinary historical value on the agricultural state of the districts to which they relate, and every credit must be given to Sir John Sinclair for the energy and perseverance with which he strove, in face of opposition within and without, to bring them to completion. Nor must it be forgotten that the surveys themselves, and the correspondence which the reports inspired, stirred up a spirit of agricultural inquiry throughout the kingdom that could not fail to have good results. As William Wilberforce, the philanthropist, himself once an Ordinary Member of the Board, said to his friend Robert Osborne, Recorder of Hull, in a letter dated Sandgate, September 14, 1813:—

> What was said of himself by Falstaff in respect of wit, may be said of Sir John Sinclair in respect of agriculture (and half of it may be said in respect of wit too; I don't say which half), and a high praise it is, that he not only superabounds with it himself, but he has been the cause of it in other men; for what other benefits may have resulted from the Board of Agriculture (Sir John's *cher enfant*) I will not take it upon me to pronounce, but I have myself seen collected in that small room several of the noblemen and gentlemen of the greatest landed properties in England, or rather in the British Isles; all of them catching and cultivating an agricultural spirit, and going forth to spend in the employment of labourers, and I hope in the improvement of land, immense sums which might otherwise have been lavished on hounds and horses, or still more frivolously squandered on theatricals. (*Life of William Wilberforce*, 1838, vol. iv. p. 112.)

According to his son and biographer, it was for private financial reasons that Sinclair retired from the Presidency in 1813. But as an Ordinary Member he continued to attend the meetings until within a year of the Board's extinction, his last appearance, as recorded in the minute-book, being on June 26, 1821. He was succeeded by the third Earl of Hardwicke, K.G., who for the rest of the Board's existence held the Presidency alternately with the fourth Earl of Macclesfield, the former being President in 1813–1816 and 1819–1821, and the latter in 1816–1819 and 1821–1822.

Lord Hardwicke, one of the most distinguished as well as popular of the Board's Presidents, was Lord Lieutenant of

[1] *Correspondence of Sir John Sinclair, Bart*, vol. i. p. 264.

Ireland from 1801 to 1806. His nephew, who succeeded him as fourth Earl, was President of the Royal Agricultural Society in 1843. Lord Macclesfield was Lord Lieutenant and Custos Rotulorum of the County of Oxford. His nephew, the sixth Earl, was a member of the Council of the Royal Agricultural Society in 1860–61, and as an octogenarian Governor of the Society attended the Leicester Meeting in 1896 shortly before his death. An hereditary link between the old Board and the Society is still happily continued in the person of his son, the Hon. Cecil Parker, the Society's Honorary Director, and Chairman of its Veterinary Committee.

Miscellaneous Inquiries of the Board.

It would be impossible to enumerate in this article even a tithe of the miscellaneous subjects of agricultural interest which occupied the attention of the Board during the twenty-nine years of its existence. Some of them have been previously described. I propose, therefore, to refer briefly to such of the others as are likely to interest readers of the Journal. Early in 1801, a Captain Hoar waited upon the Board to demonstrate his skill with the *Virgula divinatoria*, or divining rod, and accompanied by several of the members he proceeded to Hyde Park. The position of the wooden water mains having first been ascertained from the keeper of the reservoir, Captain Hoar was led by the Secretary through the Park into Grosvenor Street, with the result that the position of the mains was in all cases correctly located by the agitation of the rod. In the same year the Board presented a parcel of Indian seeds to the King, who had recently prepared a spot at Kew for the naturalisation of foreign vegetables. In 1802, the General Committee reported in favour of obtaining annual returns throughout Great Britain of the quantity of land sown with turnips or other green crops, or left for clean summer fallow, and it was proposed that these returns should be collected by the assessors of King's taxes. (The present agricultural statistics are collected by officers of the Inland Revenue.) In 1805 Mr. Humphry Davy, the Board's chemist, reported upon a "substance in South America called guano [misspelled 'guan*a*'] being the dung of birds," and he stated that having analysed this substance he found that "one-third of it consisted of ammoniacal salt, and that it contained other salts as well as carbon." The importation of guano as a commercial product commenced about the year 1843. A proposal for lodging wheat in granaries, to be put under the King's lock whenever the ports were open for exportation, was made about this time. In 1806 the Board's premiums included the offer of 100 guineas for the best machine

for reaping corn. In 1808 Lady Penrhyn's agent attended to explain a furze-mill which she presented to the Board, with an account of her practice of feeding horses and cattle on furze. On one occasion, in connection with expedients for increasing the employment of the poor, specimens were submitted of candlewicks prepared from *Juncus glomeratus*, a species of rush growing on Wimbledon Common, and of the inner bark of trees to be used in the manufacture of ladies' hats and bonnets, in order to supersede the necessity of importation from Leghorn. In 1817 the Board paid 8*l*. as the cost of a map and memoir of the soil and substrata of the kingdom which was submitted by the celebrated William Smith, the father of English geology, popularly known as "Strata Smith." The Board did much to encourage the use of improved agricultural implements, trials of which were occasionally held.

Decadence of the Board.

With Sinclair's retirement from the Presidency we enter upon the period of the Board's decadence and final dissolution. Arthur Young, whose eyesight began to fail in 1808, now became totally blind, and this, added to the infirmities of advanced age, rendered him incapable of his former active services as Secretary. His unrivalled agricultural knowledge and experience were still available, but with the publication of the last of the agricultural surveys, little was done by the Board beyond the offer of annual premiums, and an attempt to revive the volume of Communications.[1]

The Board was now at a loss as to how to expend its Parliamentary grant of 3,000*l*. a year. At the annual meeting of March 24, 1819, the Treasurer's accounts showed a credit balance of about 2,300*l*., and it was therefore decided to apply for only 1,000*l*. for the year 1819, instead of the customary grant of 3,000*l*., the letter to the Treasury stating that the Board was "happy to seize the first opportunity that has presented itself of replacing a part of the extra sums, which on former occasions the Board received from the liberality of Parliament." A step of greater inanity could hardly have been taken. The Treasury promptly seized the opportunity of saving the grant, and after the death of Arthur Young on April 20, 1820, a letter from the Treasury Office of October 24, 1820, intimated that "the Lords of His Majesty's Treasury did not feel themselves justified in recommending to Parliament to make any further grant for the service of the Board of Agriculture." Representations as to the "feeling which might be excited by the discontinuance of the Board's premiums and by the loss of such a centre of communication as the Board of

Agriculture had proved to be to all the other Agricultural Societies of the Kingdom" were made to the Prime Minister. But as Lord Liverpool had never been a friend of the institution, they were without effect; and the Board was thus thrown entirely upon its own resources.

Not anticipating this decision of the Government, the Board had on May 2, 1820, elected as Young's successor in the Secretaryship, Mr. George Webb Hall, of Sneed Park, Gloucestershire, who had been an Honorary Member since May 7, 1805. Mr. Hall enjoyed considerable reputation as an agriculturist, and was highly popular with the farming community. He was an authority on sheep and wool, and had taken a leading share in the agitation for the imposition of Protective duties on foreign corn. His tenure of the Secretaryship was marked by several noteworthy developments, which it was reserved for the Royal Agricultural Society at a later period successfully to continue.

On March 13, 1818, the Board decided to offer its gold medal for adjudication by provincial Agricultural Societies to the occupier of the best cultivated farm of not less than 100 acres, in their respective districts, the farms to be visited by inspectors appointed by the provincial societies. In 1819 seven, and in 1820 eleven, gold medals were thus given to Agricultural Societies for distribution to the successful competitors. Premiums to a considerable amount were also offered for essays on the agriculture of foreign countries. A premium of ten guineas was offered to large district societies that held annual shows of cattle for the best bull exhibited, on condition that during the ensuing twelve months he served thirty cows gratis.

Exhibition of Live Stock.

Soon after the appointment of the new Secretary the Board itself decided to institute an annual exhibition of live stock, and an agreement was made with Mr. Joseph Aldridge for the holding of the show at Aldridge's Repository, Upper St. Martin's Lane, for a sum of 100*l.*, to include the necessary accommodation and food for the animals. The exhibition was fixed for Monday and Tuesday, April 9 and 10, 1821, and as this was the first Agricultural Show held in Great Britain under the auspices of a National Agricultural Society, it is fitting that some record of the prizes and proceedings should here be given. The following is therefore a summary of the prizes offered, which amounted to 685*l.* :—

To the several breeders of the best—

Six Bulls, 30*l.* each.
Six Cows or Heifers, in calf, or with calves by their sides, 20*l.* each.
Six Rams, 15*l.* each.

Six Pens of Three Breeding Ewes, with or without lambs, 10*l.* each.
Six Boars, 10*l.* each.
Breeding Sows, 10*l.* each.
Draught Stallion, 30*l.*
Draught Mare, 20*l.*
Steer of any breed, 1st, 30*l.*; 2nd, 20*l.*; 3rd, 15*l.*

The merits of the animals were to be judged by comparison with similar descriptions of the same breed. In the bulls the judges were instructed to seek for symmetry, strength of constitution, aptitude to fatten, quality of flesh, and general docility of temper. In the cows and heifers particular attention was to be paid to the quantity and quality of milk, and where meat and milk could not be united in the same animal they were to select the three best cows for milk and the three best for meat. Similar points to those enumerated in the case of bulls were mentioned as guiding the judges in their awards to the other descriptions of stock. The prizes for sheep were to be divided equally between the long-woolled and short-woolled breeds. The entries numbered ten bulls, nine cows and heifers, several fat steers and cows, seven pens of Leicester and Cotswold rams and ewes, twelve pens of Down and nine or ten pens of Merino rams and ewes. A curious exhibit was that of a ram imported from Southern Italy, which was described as having "monstrous long horns, with a narrow back, flat shaggy sides, and wool somewhat resembling the coat of a Polar bear." It appears to have been regarded as an object-lesson, showing how not to breed sheep. Most of the cattle exhibited were of the Shorthorn, or—as they were then called—the Durham breed; but there were also specimens of Herefords, Devons, Longhorns and Alderneys. Implements were admitted for exhibition on payment of 1*l.* 1*s.* for one exhibit and of 2*l.* 2*s.* for two or more exhibits. In this department, Mr. Gibbs, who had been seedsman to the Board since May 7, 1799, and who was subsequently seedsman to the Royal Agricultural Society, exhibited varieties of grass and turnip seed with specimens of roots. Ploughs, scarifiers, drills, and turnip and chaff cutters were also shown, there being about six implement exhibitors in all.

At five o'clock on the following day, a company of fifty sat down to dinner at the Freemasons' Tavern under the chairmanship of Lord Macclesfield, the President of the Board, who afterwards presented the pieces of plate to the successful competitors. During the proceedings a protest was made against the award of prizes to the fat steers, it having been the general expectation that the Show was exclusively for the encouragement of breeding stock. In a defence of the judges, Mr. John Christian Curwen[1] admitted that he considered the judges

[1] One of the later Ordinary Members of the Board, a Member of Parliament

had been in error in awarding the premium to a bull "which was certainly too fat to serve," that their attention had been "drawn away to fat, and that they had not paid due regard to symmetry, which was the merit to be appreciated in breeding animals." Lord Althorp, afterwards the third Earl Spencer, the founder and first President of the Royal Agricultural Society, was elected an Ordinary Member of the Board in connection with this Show. He was invited to act as one of the three judges, but declined to do so. A second Agricultural Show, essentially similar to the one described, was held on April 22 and 23, 1822.[1]

Dissolution of the Board.

Upon the stoppage of the Government grant, an earnest effort was made to maintain the Board under its existing charter by the donations and subscriptions of its Ordinary and Honorary Members. It was decided to admit the public as Honorary Members, on the certificate of two existing members that the candidate was "a fit and proper person to be elected"; and the annual subscription of both the Ordinary and Honorary Members was fixed at 2*l.* 2*s.*, or a life composition of twenty guineas. At first the scheme promised well, and the General Committee reported on May 25, 1821, that "so many donations and subscriptions had been received as to place the continued existence of the Board upon a reduced establishment beyond all hazard." They also considered that with the support which might be obtained from annual subscriptions, the Board "might be able to enlarge its sphere and extend its influence to every corner of the United Kingdom."

Meanwhile the hope of a renewal of the Government grant was not abandoned, and petitions on several occasions were presented to the Treasury with the object of obtaining, if not the same amount of money as before, at least a sum sufficient, with the donations and subscriptions received, to save the Board from extinction. The Board's efforts in this direction, however, proved ineffectual, and when upon a review of the financial position on May 24, 1822, it was found that the subscriptions received were inadequate, it was decided to return them, and to dissolve. Legal difficulties arose in the way of any formal surrender of the Charter, and it was therefore resolved to simply send the records, papers, and other documents to the Record Office in the Tower, and to transmit the balance of the funds of the Board to the Chancellor of the Exchequer. A sum of

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ment, and the President of the Workington Agricultural Society, to which Society he made some very interesting annual reports.

[1] For Reports of these Shows, see *Evans and Ruffy's Farmers' Journal and Agricultural Advertizer*, April 16, 1821 (p. 123), and April 29, 1822 (p. 131).

money was placed in the hands of the Secretary for the editing and revision of any articles in the possession of the Board which he might consider worthy of publication; a further sum was reserved for "outstanding contingencies"; and the actual balance transmitted to the Government amounted to 519*l*. 14*s*. 2*d*.

The final meeting of the Board was held on June 25, 1822, when Lord Macclesfield presided and signed the minutes for the last time; but a financial statement, showing the Board's final payments and the balance transmitted to the Government, appears in the minute-book with the signature of Lord Macclesfield, under date July 10, 1822.

Thus ended an institution which, whatever its mistakes and failures, did splendid work on behalf of agriculture. It was the embodiment of a passion for agricultural improvement which dominated all classes, and which was equally creditable to the King, the aristocracy, and the humblest yeomen. Above all, it was the pioneer of the Royal Agricultural Society of England, whose great object, "the general advancement of English Agriculture," though sought by different means and under more satisfactory conditions, is identical with that of its predecessor of a hundred years ago.

ERNEST CLARKE.

13 Hanover Square, London, W.

LIST OF THE PRESIDENTS OF THE BOARD

Whose Portraits appear in the Frontispiece.

1793 to 1798, 1806 to 1813.

THE RIGHT HON. SIR JOHN SINCLAIR, BART. (*b.* 1754, *d.* 1835)
(*Portrait from an Oil Painting by Sir H. Raeburn, R.A.*)

1798 to 1800.

JOHN SOUTHEY SOMERVILLE, 15TH LORD SOMERVILLE (*b.* 1765, *d.* 1819).
(*Portrait from an Oil Painting by S. Woodforde, R.A.*)

1800 to 1803.

ROBERT SMITH, 1ST LORD CARRINGTON (*b.* 1752, *d.* 1838).
(*Portrait from a Lithograph from life by M. Gauci.*)

1803 to 1806.

JOHN BAKER HOLROYD, 1ST EARL OF SHEFFIELD (*b.* 1735, *d.* 1821).
(*Portrait from an Oil Painting by Sir Joshua Reynolds, P.R.A.*)

1813 to 1816; 1819 to 1821.

PHILIP YORKE, 3RD EARL OF HARDWICKE, K.G. (*b.* 1757, *d.* 1834).
(*Portrait from an Oil Painting by Sir T. Lawrence, P.R.A.*)

1816 to 1819; 1821 to 1822.

GEORGE PARKER, 4TH EARL OF MACCLESFIELD (*b.* 1755, *d.* 1842).
(*Portrait from a Crayon Drawing at Shirburn Castle.*)

1793 to 1820.

ARTHUR YOUNG (Secretary of the Board), (*b.* 1741, *d.* 1820).
(*Portrait from a Miniature by W. Jagger, 1811.*)

NEW FORMS OF HOP KILNS.

WHATEVER may have been the case in former days, there can be no doubt that at the present time the hop-growing industry in England is passing through a period of depression, to meet which taxes the powers of the producer to the utmost. With hop-growing, as with other industries, the result of depression has been to stimulate a higher and more scientific form of cultivation and management, and it appears to me to be certain that—whatever may be the ultimate result of the foreign competition and the rapidly vanishing margin between the English growers' receipts and expenditure, as regards properly equipped and managed hop land—the man who tries to cope with the intensifying difficulties of hop production in the old-fashioned way, and with obsolete machinery, will be left behind and must drop out of the running altogether. With these brief introductory remarks I proceed to give a description of the newly erected hop kilns at Buriton, Hampshire, upon the estate of Mr. John Bonham-Carter.

One of the difficulties which had to be faced when the Buriton Manor Farm came into hand three years ago was that the old hop kilns had become obsolete and were much too small for the acreage and for the consequent crop they were required to cure, and it therefore became imperative that the kilns should be remodelled. After visiting several kilns where modern plant had been installed, and consulting many gentlemen whose kindness I am pleased that this opportunity afforded by the Royal Agricultural Society enables me gratefully to acknowledge, I prepared plans and specifications for what are practically new kilns, and these were erected under my supervision during the summer of 1897, in time for the curing of that year's crop. The kilns have been worked by Mr. A. C. Marriage, of Buriton, and to him I am indebted for the figures giving details and cost of working.

The total area under hops upon the Buriton Manor Farm is 46¼ imperial acres (15½ acres being on wires), besides which some six additional acres have been recently planted, though not yet cropped. Upon these 46¼ acres the recent yields have averaged—

In 1895	13	cwt. per imperial acre
„ 1896	6¼	„ „
„ 1897	12	„ „

As the gardens are mostly planted with Goldings, and ripen within a very short period of time, the difficulty of drying with

kilns which were below their work was much intensified. In 1897 at Buriton 84 bushels of green hops yielded one cwt. of cured hops; many growers, I am told, were obliged this season to dry 100 green bushels to the cured cwt.

The old buildings, a plan of which is presented in fig. 1, were built partly of local "blue rock" of the chalk series, and partly of flint. They were of irregular shape (no doubt because they were built at different periods), the hops from kilns Nos. 1 and 2 discharging into one bagging-room, and those from kilns Nos. 3 and 4 into another. It had become difficult to keep the roof watertight, as the sulphur fumes had destroyed the slate nails, a trouble that was accentuated by the necessarily steep slope of the cupolas.

Add to this that, as the buildings were only two storeys high, all the green hops were obliged to be carried on to the hairs over the just-discharged cured hops which were lying on the same floor, and that when fully loaded the kilns were much below the capacity needed to provide for the acreage, and would only cure in twelve hours 1,034 bushels of green hops (280 bushels on each of the 20 by 20 ft. hairs, 250 on the 20 by 16 ft., and 224 on the 18 by 18 ft.), and it will be realised that the difficulties of dealing with even a moderate crop were very great. In fact the task could not be performed in the limited time during which the hops were at their best.

The new buildings have been formed by remodelling and adding to the old kilns in the manner indicated in fig. 2, the original walls being shown in black and the new ones by hatched lines. It will be seen that the bagging-room now becomes the central portion of the arrangement, and that all four kilns discharge into this one floor. The old kiln (now No. 5) has been left untouched, though possibly it may eventually be connected so as to be worked by the larger fan.

The area of the hairs of the four new kilns is:—

Nos. 1 and 2	20 ft. by 20 ft. each
Nos. 3 and 4	20 ft. „ 16 ft. „

thus forming a total superficial extent (neglecting No. 5) almost exactly the same as that of the original kilns. The areas of firing-floor, bagging-floor, and green floor are all practically equal—50 ft. 6 in. by 18 ft., or 909 ft. superficial. Though the firing-floor is sufficient for its work, and the green floor fully large enough, I am inclined to think that the bagging-floor might with advantage have been rather wider, owing to the fact that the discharged hops now lie so close to the hot front walls of the kilns that they do not cool off as they otherwise would. On

the other hand, it is a slight advantage that the hops should fall so near to the bagging machine as to necessitate but little breakage by moving across the floor.

Walls.—The new work is executed in local brick, save the addition in height to kilns Nos. 3 and 4, which, for the sake of

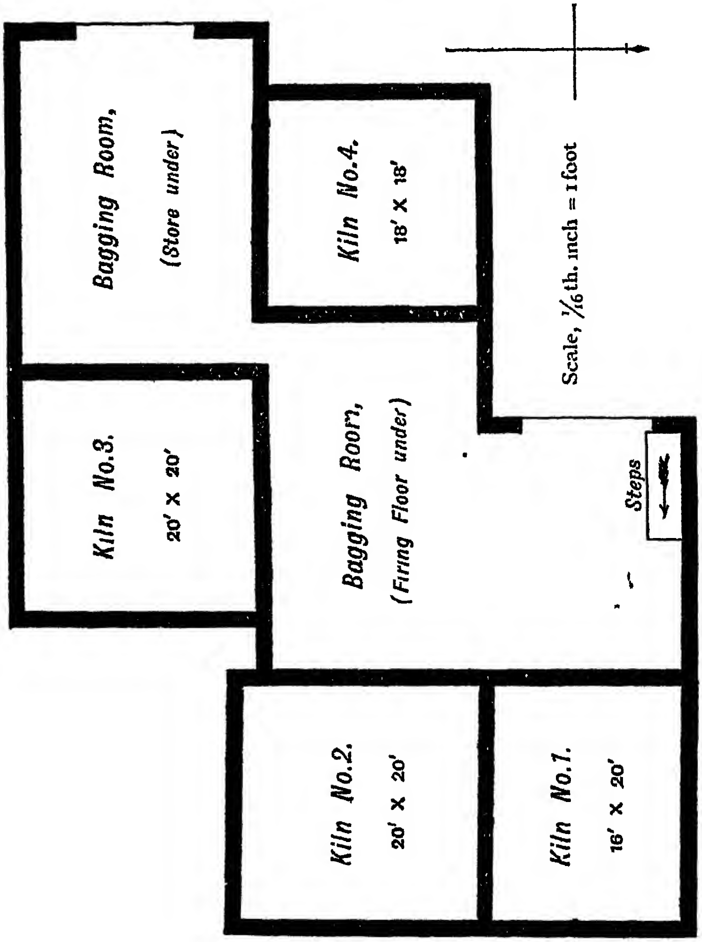


Fig. 1.—First floor plan of old buildings.

harmony with the old work, is of flint strengthened by brick string courses. The walls throughout are of 14 in. thickness, except the longitudinal interior walls on the second floor and the east end wall of the bagging-room (and green floor over), which are all in 9-inch work.

Roofs are all of Welsh Countess slates, laid on $\frac{7}{8}''$ rough board. The cost of unplaned $\frac{7}{8}''$ board of good quality is about 13*s*. per square, and that of the necessary $2'' \times \frac{3}{4}''$ slate battens for the same area is about 3*s*. 3*d*. The labour of board-

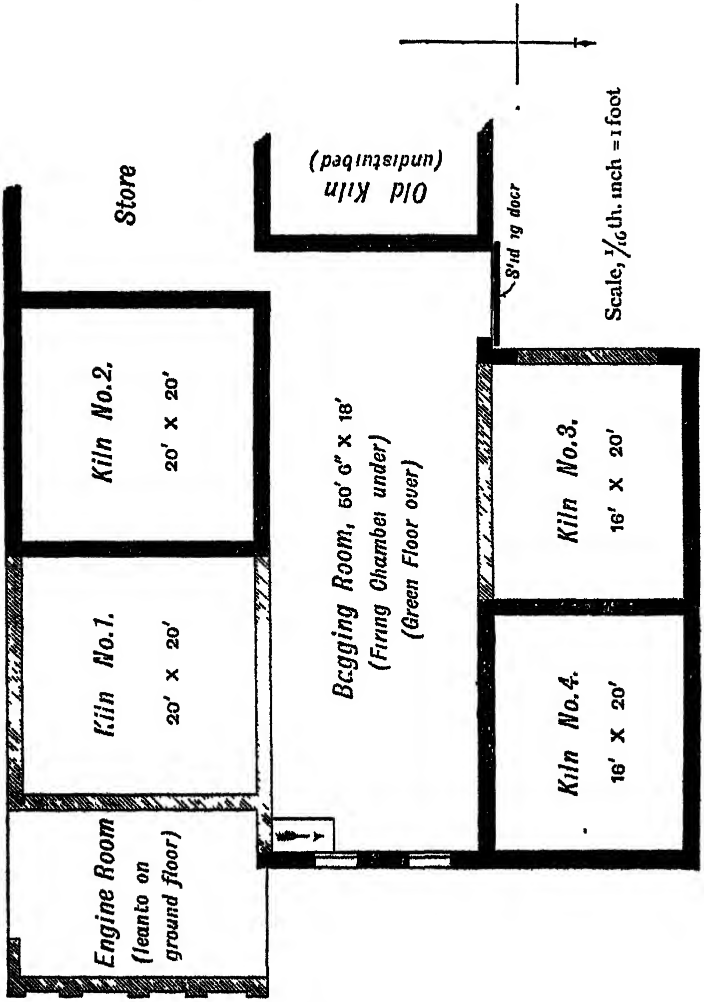
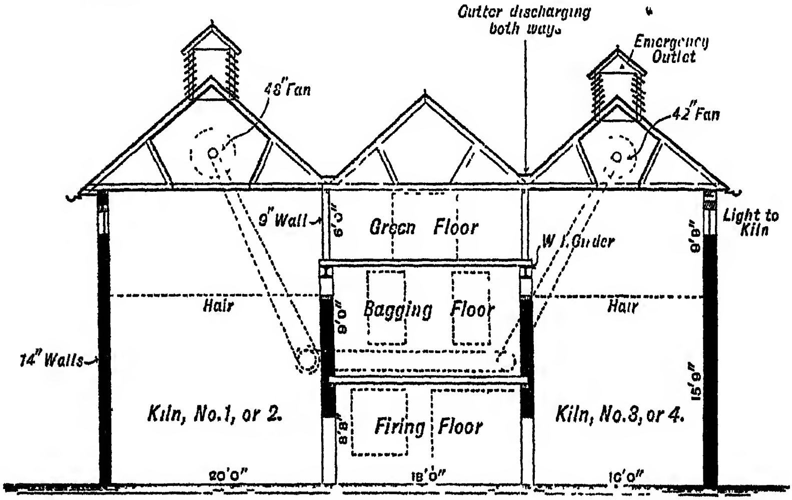


FIG 2.—First-floor plan of new buildings.

ing a roof is about equivalent to that of battening, and the quantity of nails is also the same. The felt required for rendering the kiln roofs air-tight is placed below the rafters to avoid the danger of puncture by slate-nails.

The necessary covering hoods in the three eastern gables for the fans and hoisting gear are each formed by the prolongation of the ridge-piece (7 in. by $1\frac{1}{2}$. in) and purlins (4 in. by 3 in.) which are in long lengths at that end for the purpose, carrying short rafters, boards, and slates in the same way and in the same lines as the main roofs. The outer end of each purlin is further supported by an upright (4 in. by 4 in.) from a bearer (9 in. by 3 in.) of the outside platform (forming portion of the guard-rail thereto) which, accessible from the green floor door, forms in its central portion a working place for the hoisting gear, and then, going right and left, provides means of access to the discharge side of each fan.



Scale, $\frac{1}{16}$th. inch = 1 foot

FIG. 3.—Cross section (south to north); dotted lines show elevation at east end.

It will be seen from figs. 3 and 4 that the roofs have an ordinary pitch, and that the old cupolas are all removed.

Fans and machinery.—The fans were supplied by the Blackman Co., 63 Fore Street, London, E.C., and were fixed under the supervision of their engineer, Mr. W. W. Wardle, to whose courtesy I am indebted for the new method of firing described later.

The southern kilns Nos. 1 and 2—combined area of hair 800 ft. superficial—are worked by a fan (as indicated in fig. 3) of 48 in. diameter, fixed in a double $4\frac{1}{2}$ in. ring of brick in cement in the outer gable end of kiln No. 1. This fan is driven at a normal speed of 560 revolutions per minute, and is capable

in free air of moving 30,000 cubic feet of air per minute. It is furnished with fast and loose pulleys (8 in. diameter and $4\frac{1}{2}$ in. face) with sliding belt gear and cords for manipulation at ground-floor level. The cost of fan and pulleys (not fixed) was 21*l.*

The northern kilns Nos. 3 and 4—combined area of hair 610 ft. superficial—are worked by a similar fan, but of only 12 in. diameter. It has a normal speed of 640 revolutions per minute, and is capable of moving in free air 20,000 cubic feet of air per minute. The cost of fan and fast and loose pulleys (7 in. diameter and 4 in. face) was 18*l.*, the fixing being extra. This fan is fixed in the outer gable end of No. 4 kiln, just above ceiling level, and in the same manner as the larger fan.

The motive power for driving the fans is obtained from our traction engine, 6 horse-power nominal, which is stationed in a lean-to engine-shed—20 ft. long by 14 ft. 6 in. wide—at the eastern end of kiln No. 1, as already shown in fig. 2. The power is taken from the 4 ft. fly-wheel, running at 140 revolutions per minute, by a 5 in. leather driving-belt, to a 24 in. by 6 in. pulley on a $2\frac{1}{2}$ in. main countershaft, fixed in the engine-room on the outer face of the portion of the bagging-room wall which projects beyond the wall of kiln No. 1. From this shaft the 48 in. fan is driven by a 4 in. leather belt off a pulley 16 in. by 8 in.

A second $2\frac{1}{2}$ in. shaft is fixed through the eastern wall of the bagging-room on the opposite side to shaft No. 1. This runs at the same speed as the first shaft—280 revolutions—and is driven from it by a 4 in. leather belt passing through the south wall of the bagging-room, and running close to the inner face of the east wall immediately above floor-level. All is closely boxed in. The second countershaft drives the 42 in. fan by a $3\frac{1}{2}$ in. leather belt off a 16 in. by 8 in. pulley. Both the fan belts are outside the building, but the belt from shaft to shaft is inside, to allow of the free working of the hoist outside.

To provide for continuous running, the bearings of both fans and shafts are lubricated by means of Stauffer's patent lubricator—an appliance which consists of a small circular metal box with a screw cap, fixed in position by a short tube screwed into the cap of plummer block. Being charged with a grease compound which is said to liquefy at about 150° F., the only attention these lubricators need is that half a turn be given to each cap once a day and the grease replenished when necessary; the cost of the grease is 8*d.* per lb. retail.

The inner journals of the fans are lubricated from outside the building by means of long tubes of about $\frac{1}{4}$ in. bore

screwed into the inner journal and brought out, parallel to an arm of the fan frame, through the wall, and furnished with a screw-capped lubricator box of the usual pattern outside; the tubes are filled with grease before fixing.

The total cost of belts, fans, pulleys, countershafts, bearings and lubricators, with delivery and fixing, was 85*l.* 16*s.* 10*d.*—bricklayers' labour being extra to this.

Air-tight fittings.—As each pair of kilns is worked on the same method, it will suffice to describe the construction of the southern pair.

The kiln farthest from the fan—No. 2—has no ceiling, but is worked from a side aperture (42 in. by 36 in.) in the division

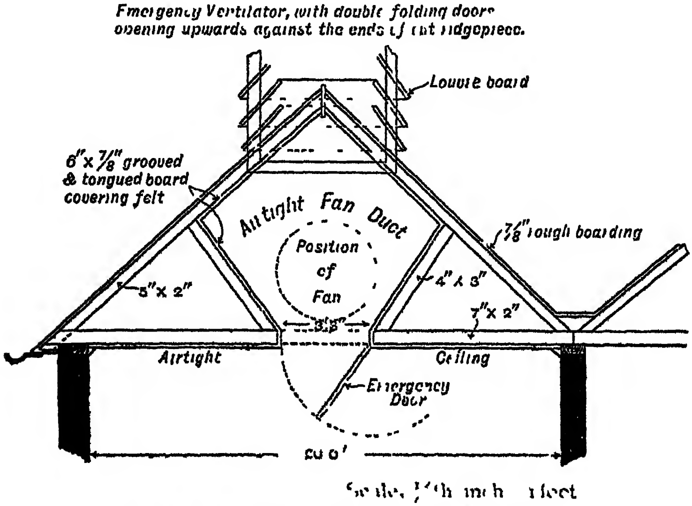


FIG. 4.—Cross section of air-tight duct in roof of kiln No. 1.

wall between it and No. 1. This aperture is capable of adjustment or complete closure by means of a wooden slide door running easily on an overhead rail, from which it is hung by small pulleys and worked by cords from the charging door in the green floor.

The roof of this kiln is made air-tight by means of inodorous felt (at 9*s.* 6*d.* per roll of 25 yds., 32 in. wide), secured by flat-headed tacks to undersides of rafters. The felt runs up and down with the slope of the roof, every joint is lapped and made on a rafter, even if an inch or two of felt be wasted, and the lower edges are rendered perfectly tight by means of another strip of felt built into the wall below wall-plate, projecting 6 in. from the wall face, and turned up to cover the edges of the roof felt,

the whole being finally fixed by a lath nailed to the wall-plate through the two thicknesses of felt. The edges where roof and gable walls meet are secured by wooden fillets.

To enable the fan to exhaust from both kilns—either together or separately—a perfectly air-tight duct or chamber of diamond section is formed, in the roof of kiln No. 1, of inodorous felt covered by 6 in. by $\frac{7}{8}$ in. grooved and tongued boards of first-class quality.

This air-tight casing (fig. 4) commences at the ridge of the roof, follows the rafters (5 in. by 2 in.) down the slope until the purlin is reached, then extends along the inner face of the struts (4 in. by 3 in. on every other rafter) to the roof-ties (7 in. by 2 in.), when it becomes a ceiling to the kiln—all felt runs with the rafters, struts, or ties, the boards of course at right angles thereto. The edges of felt are secured at the walls as in the case of kiln No. 2. The lower side of the duct is completed by the doors of the breakdown arrangement described subsequently (p. 53).

The area of the cross section of the air-duct in kiln No. 1 is about 54 ft. superficial, and in the similar case of kiln No. 4 about 30 ft. superficial. These ducts must be in area at least equal to that of the feed surface of the fan which draws through them. I do not think it judicious to have them much larger than that area, on account of the increased amount of air-tight casing to be provided, but they must be not less than the fan area or the fan will be partially choked. The area of the feed surface of our 48 in. fan is 20·5 ft. superficial, and of our 42 in. fan 16 ft. superficial.

Hoisting Gear.—One of the great advantages of the new kilns over their predecessors lies in the fact that the green hops are received on a special floor, there being thus no chance of accidentally spilling green hops among the cured ones, and no delay in emptying the carts as they come from the gardens.

The hops are usually carried on Scotch carts holding from twenty to forty bags of 12 bushels of green hops each. The carts are brought under the platform outside the green floor door, which is about 20 ft. from ground-level.

The apparatus for raising the hops consists of a 2 in. wrought-iron shaft, working in bearings carried on two 9 in. by 3 in. brackets fixed in the front gable wall of the green floor, and secured within by passing under roof-tie. This shaft, which is situate under the projecting hood of the green floor roof, carries at either end a double flanged iron drum of 6 in. diameter and 12 in. face, on which winds a flexible wire rope ending below in about a foot of chain with an iron ring for looping round the mouth of the bags.

The hoist is worked either from the ground, or from the platform, by means of an endless cotton rope passing over a V-grooved iron wheel, of 24 in. diameter, fixed on the shaft near its centre, the bags in their ascent opening double flap doors in the platform.

As no heavy weights will be elevated by its means, the great point aimed at in designing this hoist was ease in working combined with celerity; the first object being attained by the four to one gearing, and the second by the fact that whereas the one drum winds right the other winds left, and thus as soon as one bag is released another is ready to ascend. The weight of one bag of green hops even when wet is only

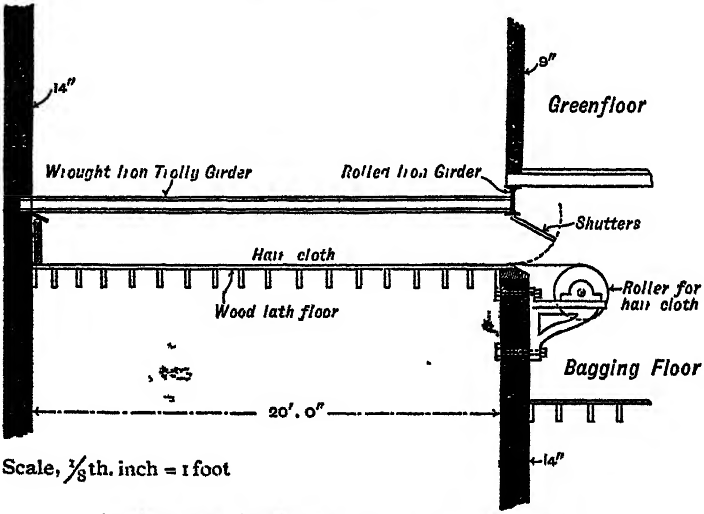


FIG. 5.—Cross section of rolling floor, from back to front of kiln.

about 60 lb., and though two be attached at once no great exertion is required to work the hoist.

The cost of hoist, bearings, cotton and wire ropes was 7*l.*; that of fixing, which was merely nominal, being extra to this.

Rolling Floors.—To avoid the necessity of "ploughing," or moving the hops whilst on the hairs, and to prevent breakage and loss of lupulin thereby, the patent rolling floors of Messrs. A. Hetherington & Co., of Alton, Hants, have been fixed in every case.

A floor of this type (fig. 5) consists of an ordinary horsehair cloth kept taut by iron laths (1 in. by $\frac{5}{16}$ in.) lying crosswise of the kiln, and fixed to the under side of the hair. These laths slide over iron runners (1 in. by $\frac{5}{8}$ in.), which are screwed to the ordinary

wood lath floor from back to front of kiln. The edges of the hair travel in iron channels on the side walls of the kiln, and terminate at the back in two iron shoes to secure easy running.

The hops are discharged into the bagging-room through an opening 2 ft. high and extending the whole width of the kiln—the wall above being carried on rolled iron girders—by winding the hair forward on to an iron roller (4 in. diameter) fixed for the purpose in front of, and slightly below, the opening. The hops fall into the bagging-floor by their own weight, and are prevented from falling out behind, into the firing chamber of the kiln below, by a vertical backboard, which, fixed to the extreme end of the hair cloth, travels forward with it when it is wound out. The sides of the kiln are boarded up to a height to correspond with this backboard, and the front opening is closed by shutters hinged to open against the bagging-room ceiling, and shutting down tight on to the cloth when at work.

The rolling floors are wound back into place by means of flexible strand wire ropes secured to the backboard, running through double-guarded pulleys in the back wall of the kiln, and worked by means of a long iron spindle fixed to the back wall of the firing-chamber below.

The hair being drawn back and the shutters closed, the loading is done through the charging-door from the green floor above by means of a pair of wooden trollies at about 2 ft. 6 in. above the level of hair, each about 2 ft. wide, and of length equal to half the width of the kiln. They are furnished with small single-flanged wheels running freely on a central wrought-iron girder, fixed for the purpose from back to front of the kiln, their outer extremities being on angle irons fixed to the side walls of the kiln. A guide rope extending across the kiln at a convenient height enables the workman standing on a trolly to move it to and fro as required.

The cost of these roller floors, fixed complete, with iron girders for front opening, and double trollies (which are not absolutely essential, though I think desirable), but not including the hair cloths or the wood lath floor below (which latter is sometimes left out, but I think wrongly, as it then becomes impossible to step down on to the hair in case of need), is about as follows:—

For a kiln having a mouth 20 ft. wide, £40
" " " " 18 " " £35

The best position for the wood floor under hair is with the laths running from side to side of the kiln, but in the case of old kilns (as in Nos. 2 and 4 at Buriton) the old floors are left exactly as they were.

Lighting by day.—The bagging-floor and firing-floor are lighted by windows in the usual way.

The green floor is lighted at about one-third down each slope of roof by means of three courses of glass slates ($\frac{1}{8}$ in. rolled plate) of the same size as the slates (20 in. by 10 in.), and laid in exactly the same way, save that each glass slate is secured by two flat-headed steel screws, and is left quite loose to minimise the chance of breakage. This plan was adopted also in the engine-house, and is much more satisfactory and water-tight than framed skylights can ever be.

The cost is 5*l.* 4*s.* 9*d.* per square of 100 ft. superficial for the glass, and 12*s.* per square for screws and labour of fixing, the comparative cost of Welsh Countess slates being 1*l.* 19*s.* 3*d.* per square, with 4*s.* per square for labour and nails.

The kilns are each lighted by means of a sheet of rough plate-glass, 40 in. by 21 in., built into the brickwork 4½ in. every way and grouted in. Exteriorly a brick arch is turned over the face of the glass to carry the wall-plate for the roof, and interiorly a lintel is placed, the glass passing between the two and bearing no superior weight.

Lighting by night.—The building is lighted from a 55-volt Crompton compound dynamo (30 ampères, 1,640 revolutions per minute) bolted to two 9 in. by 3 in. bearers on the engine-house wall, at such a height as to be secure from accident. From this the main cable, $\frac{7}{16}$ S.W.G., carrying a double pole 30-ampère main fuse in porcelain cover, is taken along the engine-room wall, through the wall of the main building, to a fuse-box under floor of bagging-room.

Each floor is wired ($\frac{7}{20}$) and fused separately, and two 12-ampère Tumler switches are fitted, one to turn out the lights in the bagging-room, and one for the green floor lights. Each lamp is properly fused, but switches are not fitted except as stated, one to each upper floor.

The main wires to each storey are carried along the centre of the ceilings and secured to the under side of the floor joists by wooden cleats (casing is only used on walls), and the leads ($\frac{1}{16}$) carried to single lamps right and left as required. In the case of the green floor the main wire runs up a rafter and along the ridge, the lamps being suspended on short lengths of flexible cord. Each kiln is fitted with one 16 candle-power lamp, fixed slantingwise on the wall-plate, and close under the ceiling, with a metal reflector behind to throw the light down upon the hops.

All the lamps are Ediswan 16 candle-power, bayonet cap, clear glass, and are fitted as follows:—

		Lights.	
Second floor—	green floor	4	
"	4 kilns	4	
"	exterior receiving platform	1	
First floor—	bagging-room	4	
"	store beyond	2	(can be cut off)
Ground floor—	firing-room	4	
"	store beyond	2	(can be cut off)
"	bottom of kiln No. 5 (used as men's room)	1	(" ")
"	engine-room	3	(one over dynamo for light when lubricating)

The dynamo, which was secondhand, cost 17*l.*, and the remainder of the installation, including the pair of 36 in. by 3 in. fast and loose pulleys on main shaft, cost 17*l.* 6*s.* 7*d.* The fixing was extra, but I have no separate figure for this not large item, as it was done by our own men without trouble.

The light—which is probably the first case of the adaptation of electric light to hop kilns—gave great satisfaction, and marked a very decided advance on the old plan of portable paraffin lanterns or naphtha flares. Beyond sinking fund the cost after installation is practically confined to replacement of lamps, which are supposed to last 1,000 hours and cost 1*s.* 9*d.* each (Ediswan), the wear of commutator brushes (cost 5*s.* 6*d.* per pair), and the lubrication of dynamo.

In our case the motive power costs nothing, as the engine is well above the work of the fans, and I doubt whether the extra consumption of fuel for the light is even appreciable. The usual calculation of electrical engineers is, I believe, one indicated horse-power for every ten 16 candle-power lights.

As the light at Buriton is driven directly (without accumulators, the use of which I strongly deprecate for such an installation), a single paraffin lamp is placed on each storey in the event of an accident or temporary stoppage of the engine.

Breakdown Arrangements.—In case of any accident causing lengthy stoppage of the fans (save for personal discomfort, a short stoppage say of about a quarter of an hour is of little consequence), it is necessary, in order to avoid serious damage to the sample, that arrangements should be made to get the "reek" off the hops by other means. This is provided for in the manner now to be described.

In the centre of each kiln roof is a square opening (5 ft. by 5 ft. in the large kilns and 4 ft. by 4 ft. in the smaller ones) covered, as shown in fig. 3, by a louvre-boarded cupola. This is furnished with a pair of folding shutters opening upwards against the ends of the main roof ridge so as to afford as large an air passage as possible. These shutters are opened by cord from the charging-door of each kiln, and constitute the whole

of the emergency arrangement in the case of kilns Nos. 2 and 3.

As regards kilns Nos. 1 and 4, however, there is a ceiling intervening between the hops and the outer roofs. The central portion (3 ft. 3 in. by 3 ft. 3 in.) of this ceiling forms the opening (controlled when necessary by a sliding shutter) through which the fan draws, and naturally in case of breakdown this would be open; beyond this it is arranged that, by a sharp jerk of a cord which is fixed immediately inside the charging-door, the remainder of the ceiling which forms the lower part of conduit to fan shall, by the withdrawal of two L-shaped levers, fall down and hang from the hinges in a vertical position, the whole operation being merely a matter of seconds. This leaves an aperture 3 ft. 3 in. wide for almost the whole length of the kiln, and, coupled with the throwing wide open of the firing-doors on the ground floor, will enable the reek to be kept clear from the hops until the fan can again be started.

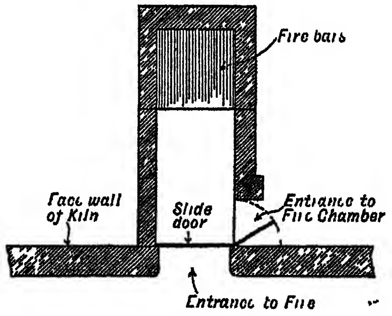
In designing these breakdown arrangements, and in fact all doors and openings in hop kilns, it is essential to remember that they must be capable of manipulation even whilst sulphuring is being carried on. It is further very necessary to take care that every opening communicating with the outer air or with the interior of the building must be made to open away from the fan, so that when at work the suction of the fan shall tend to render the kilns more air-tight and not to cause leaks—or, worse still, draughts of cold air over the hops.

Fires.—This important part of the process of hop-drying seems to have been much neglected by practical men as well as by the scientific experts who have experimented upon the curing of hops. Temperatures we hear a great deal about; but of means of obtaining those temperatures, nothing. At Buriton three kinds of fires have been tried during the past season's work.

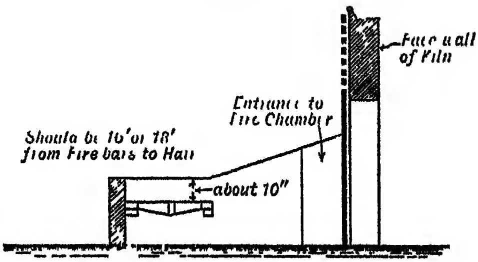
First, there was the original fire, as used in the old cupola kilns, and consisting of 48 fire-bars in two lengths, forming an open fire area 4 ft. 6 in. from back to front by 2 ft. 9 in. across the kiln, with containing wall 9 in. above top of bars, round the back and the two sides. The fire-bars lay at the level of the door-sill and the centre of the fire, almost in front of the centre of the kiln; the ash-pit was 2 ft. 3 in. deep. This fire, which had worked very well in the old kilns, was quite unsuited to the new conditions, and after one trial, when the hops took some 17 hours to dry, it was replaced by that next described and illustrated in fig. 6.

Secondly, then, there is the fire which has hitherto been con-

sidered the best kind in this district. It consists (fig. 6) of an open fire area of 3 ft. 6 in. by 3 ft. 6 in., enclosed by 9 in. walls rising about 10 in. above top of bars, and continued as training walls to the face wall of the firing-chamber, at which point they rise to a height of 4 ft. 6 in. from floor-level. It is very essential that the door-sill should be kept down as low as possible, and its position in the fire shown in the diagram is about 1 ft. 10 in. below the top of the fire-bars. A small door is placed in one training wall to admit to the fire-chamber for the purpose of winding back the rolling floors, and the whole is completed by a sliding door for controlling the admission of air. This arrangement of fire has acted very well under the forced draught of the fans, but it possesses to my mind these great drawbacks,—(1) to fire it, the attendant must enter the fire-chamber even when sulphuring, and the door must be raised; (2) the temperatures at various parts of the kiln vary considerably, and the hops are consequently not dried equally all over. This no doubt is caused by the irregular way in which the air on admission to the chamber passes over the fire.



Plan.



Section (back to front).

Scale, ⅛th inch = 1 foot

FIG. 6.—Plan and section of open fire.

Thirdly and lastly, there is the arrangement shown in fig. 7. For the details of this fire (originally used for a malt kiln) I am indebted to Mr. W. W. Wardle of the Blackman Ventilating Co, and though we have only applied it to one kiln (No. 3) at present, it is intended to adopt it throughout before next hopping season. It consists in its central portion of a closed fire area (3 ft. by 3 ft.) on the face wall of the kiln, the top of the fire-bars being 2 ft.

above the floor-line. The fire is covered by a semi-circular dome in fire-brick, and the heated air passes out over a fire-bridge 9 in. high, and downwards into a mixing-chamber (3 ft. by 3 ft.) behind, where its temperature is modified with exactitude to the desired point by means of cold air admitted at ground-level through brick ducts on either side of the fire. The top of the mixing-chamber is covered by an iron baffle-plate, the front being furnished with a movable ash-plate and an iron rising plate to fire. The doors to air-ducts are of wood, and slide sideways,—above the air-ducts on either side are hinged wooden doors for access to the chamber and for admission of air in case of break-down.

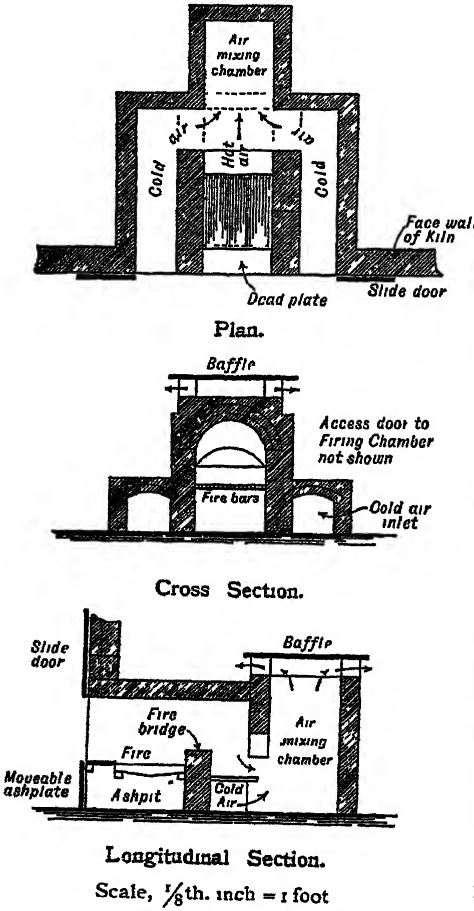


FIG. 7.—Plan and sections of closed fire.

This fire costs, of course, considerably more than that described under the second head, but we have found it more economical in fuel than that fire. For experiment, equal quantities of anthracite were weighed out to each fire and carefully compared. This fire consumed 5¼ cwt. as compared with 7¼ cwt. in the corresponding kiln, fitted with the second type of fire (each 20 ft. by 16 ft.) for 24 hours (two loadings of hops), the kilns being treated exactly alike in every way.

Further, in building new kilns, or in fitting fans to old ones where the hair is very near the fire and so occasions risk of

fire-taint to the hops, I would not hesitate to guarantee success with this method of covered firing, even though the hairs were only 10 ft. above the fire. A great economy in new kilns might thus be effected.

The firing upon the face walls instead of entering the chamber is a great boon to the workmen, and there is no trouble in burning the sulphur in the ash-pit as is done in the other case. The uniformity of temperature throughout the kiln as compared with the other system of firing is very marked, and by reason of this equality the hops can be cured in the same time as in the fellow kiln (with the second form of fire), but at a lower temperature throughout. Every time the second type of fire (fig. 6) was stoked the temperature of the kiln ran down, but this was not the case with the third type (fig. 7), as that fire could be made up without lifting the shutter.

Pyrometers.—It was intended to fix the "Arnold" patent pyrometers at Buriton, but they could not be delivered in time for this season's work. At the present moment these appear to be the only pyrometers specially designed for this purpose, but from accounts received from Kent they would seem capable of improvement.

There exists, indeed, an opportunity for the introduction of some cheap and reliable indicator of temperatures for hop-drying purposes, and one would think it should not be difficult for an instrument maker to produce one. The points necessary for its success are:—

1. Moderate price.
2. Strength and simplicity such as will fit it for use by an agricultural labourer.
3. It should be sufficiently sensitive to ensure of its correctly registering the change of temperature within say two or three minutes.
4. It must not be affected by sulphur fumes.
5. It should indicate a range of temperature from about 50° to 170° or 180°F.
6. It must be capable of registering, at a point beside the firing-door, the temperature immediately underneath the hair.

Changes of temperature in our case were indicated fairly enough by means of a glass flask suspended under the hair and connected by 14 or 15 ft. of composition pneumatic bell tube and a couple of inches of indiarubber tube to one limb of a glass U-tube filled with mercury, the other limb being open to the air. By the aid of this the dryer, after raising his door and firing up, was able to bring back the temperature accurately to the same level.

This arrangement, however, was clearly subject to changes of barometrical pressure also, and the true temperatures were gauged by long mercurial thermometers inserted from the

bagging-floor in holes drilled through the face wall of each kiln just beneath the hair, the bulb inside being protected from the direct heat of the fire.

Working the kilns.—Though the time occupied in drying is not much accelerated by the new arrangements, yet the quantity of hops upon the hairs at one time is much larger. When first starting the new kilns we charged the 20 ft. by 20 ft. hairs with 500 bushels each, and the 20 ft. by 16 ft. with 400 bushels each, but afterwards increased these quantities to 600 and 500 bushels respectively. These latter charges might without hesitation be increased to 700 bushels in the 20 ft. by 20 ft. hairs, and to 600 bushels in the 20 ft. by 16 ft. should occasion require. The depth of load under the old system was about 10 in., now it is from 1 ft. 6 in. to 1 ft. 9 in., being about 0·7 bushel per foot superficial under the old plan, as compared with 1·75 bushels now.

Time.—Under the old system the operation of loading each kiln occupied from fifteen to twenty minutes, and we find it takes about the same time under the new system, but with a charge of nearly double the quantity of hops. From two to three hours are required for sulphuring, the operation being performed immediately after the placing of the hops upon the hairs, and while they are still damp. Each load occupies the hairs about 10½ hours in drying—or an hour less than in the old kilns. Discharging is a matter of a few minutes only, the operation being performed by merely raising the front shutters and winding the hair cloth on to a roller in the bagging-room, then winding back the empty hair into its original position by means of another spindle.

Labour.—With the old kilns the labour required was that of the dryer and of two men who did the bagging, and assisted in unloading and loading as required. Usually another hand was temporarily added for loading. Now the labour consists of the dryer, assistant dryer, and one other helper. These three do everything till the hops are discharged on the pocketing floor, where two men are engaged in bagging (and do nothing else) at sevenpence per pocket. Some days these men did not work full time, but had to keep the floor clear when the fresh hops were ready to take off. Altogether the new kilns employ about a man and a half beyond what the old ones did, but as there are nearly double the hops on the floors at one time and the duration of hop-picking is much shortened, it would appear that labour is saved in the long run. Besides this, the engine-driver and his relief man cost 2*l.* a week, an expenditure which was not incurred under the old plan.

Fuel.—Very little charcoal is used by the new plan,—perhaps 10 bushels in all for lighting up fires on Monday mornings, etc. A great deal of charcoal was used in the old kilns. Of anthracite about 23 tons were this year consumed in drying 281 pockets.

Coal for engine (a new 6 horse-power traction by Wallis and Steevens).—Eight tons of steam coal (19*s.* 9*d.* per ton delivered) were used in the run of 19 days of 24 hours per day (though this also includes the coal used during two trial runs of fans, a duration of perhaps 20 hours more). This expenditure, as well as the outlay on oil for lubrication, water supply, wear and tear, and sinking fund, is, of course, an extra as compared with the old plan, but we believe that this season the enhanced price amply repaid the extra expense.

Sulphur.—Roll sulphur cost 6*l.* 5*s.* per ton delivered. Under the old plan about 36 cwt. was used to cure a 6¼ cwt. crop (1896), but by the new plan 80 cwt. was consumed on a 12 cwt. crop, the acreage being the same in both cases (46¼ imperial acres). I am told this is a very low consumption of sulphur under the forced draught of fans, and can readily believe that, with unfavourable weather, or a crop of greater bulk than can be handled in good time, a much larger amount will be needed.

As the fans should be run at one regular speed—because it does not always happen that all the kilns are being sulphured at the same time—it will be found convenient to open some communication with the outer air in the upper portion of a kiln which is being sulphured, in order that the fan may draw its feed partially from that adjusted opening, and so that the velocity of the air carrying the sulphur through the hops may be diminished. By this means much of the sulphur which otherwise is drawn through the hops at great speed, and pumped out wastefully into the outer atmosphere, may be saved.

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THE RECENT TREND OF AGRICULTURAL COMPETITION.

During the ten years ending with 1897 the annual cost of our gross imports of agricultural commodities similar to those produced in this country has risen from 133,278,416*l.* to 172,157,915*l.*, and that of our net imports from 113,412,486*l.* to 151,052,252*l.* The only items not also produced in this

country which are included are maize, some seeds contained in certain kinds of oilcake (all of which may be regarded as substitutes for home produce), and a comparatively small quantity of tropical produce in "fruit unenumerated," as it cannot be separated from non-tropical fruit. Oilcake, it may be further explained, is the only manufactured commodity besides flour and dairy produce in the items thus valued, and it is included for the reason given above.

The figures show increases of 38,879,499*l.* in the value of gross imports of agricultural produce, and 37,639,766*l.* in that of net imports in ten years, and in spite of the fall in prices. As prices have fallen, it follows that, if all imports could be brought into a common denomination of quantity with accuracy, the increase in quantity would be found much greater than the increase in value. But, to consider values only for the moment, a simple calculation shows that our bill for imported agricultural produce has increased out of proportion to the growth of our population. In 1887 the cost of our net agricultural imports was barely 3*l.* 2*s.* per head of the population, and in 1897 it was a fraction over 3*l.* 15*s.* 10*d.* Supposing the fall in agricultural prices to have been no greater than that of the prices of commodities generally, as indicated by Sauerbeck's index numbers, the cost of our net agricultural imports in 1897, at the prices of 1887, would have been 4*l.* 3*s.* per head, or 1*l.* 1*s.* more than in 1887.

Taking averages of the values of net agricultural imports in the three years ending with 1887 and the three ending with 1897, we have an increase of 32,406,603*l.*; but as the increase since 1895 has been very great, this method of comparison does not fairly gauge the progress of our expenditure on foreign agricultural produce. The values of our gross and net agricultural imports from 1887 to 1897 are shown below:—

Values of Agricultural Imports into the United Kingdom.

Year	Gross	Net
	£	£
1887	133,278,416	113,412,486
1888	142,365,979	122,600,661
1889	153,445,302	132,059,630
1890	156,934,143	135,773,586
1891	167,719,614	146,091,660
1892	166,700,168	143,353,954
1893	155,055,734	135,874,516
1894	156,847,014	137,273,640
1895	161,027,690	139,018,419
1896	166,358,791	147,968,315
1897	172,157,915	151,052,252

The extraordinary increase in 1891 over the amount for 1890 was almost entirely due to the heavy imports of wheat, barley, and oats, and the considerable rise in the price of wheat; while the great decrease in 1893 was mainly due to the fall in the price of corn, in spite of an increase in the quantity of all kinds together, but partly to a large reduction in the imports of live stock. In 1894 a much greater increase in the total quantity of grain and flour was counteracted by a heavy fall in the price of wheat, and a smaller drop on other corn; but the values of imports of live and dead meat and dairy produce increased. In 1895 there was a decrease in the number of cattle, and a greater proportionate fall in their value, while the value of dairy imports also fell; still, as corn, meat, and miscellaneous agricultural imports gained in value, the upward progress in the total continued. As for the last two years, great increases took place in the values of all the main groups of agricultural imports.

To show how the values of the chief groups of gross imports have increased, with fluctuations, since 1897, the following details are presented:—

Values of Gross Agricultural Imports in Groups.

Thousands of pounds sterling (000 omitted).

Years	Corn and flour	Live meat	Dead meat	Dairy produce	Other imports
1887	48,291	6,149	15,067	16,405	47,366
1888	51,257	7,728	15,650	17,462	50,269
1889	51,186	10,360	19,072	19,096	53,731
1890	53,185	11,216	21,121	19,505	51,607
1891	62,022	9,246	20,605	20,862	54,985
1892	58,733	9,364	22,942	22,025	53,637
1893	51,180	6,352	22,910	22,580	52,034
1894	48,220	9,090	23,206	23,056	53,275
1895	49,723	8,966	21,368	22,561	55,410
1896	52,800	10,439	25,458	23,913	53,749
1897	53,580	11,380	28,099	25,687	53,412

A glance down the columns of figures shows at once the trend of agricultural competition during the ten years following 1887. The increase in our foreign bread bill has been heavy enough, in spite of the fall in prices; but the percentage advance in the live-meat group is much greater, while the rise in the value of miscellaneous agricultural imports, including wool, lard, hides, eggs, fruit, and vegetables, is a little greater. It is, however, in dead meat and dairy produce that by far the heaviest increases have taken place.

With regard to dairy produce there is one item not included.

This is fresh milk and cream, first returned separately in the Annual Statement of Trade for 1894, when the value was 21,371*l.*, while it was 19,991*l.* in 1895, and only 5,489*l.* in 1896. The item is not included because the figures are not available for any year previous to 1894 or subsequent to 1896.

The figures showing the quantities of the first four groups will afford a better indication than the values of the trend of agricultural competition since 1887; and, to avoid accidental fluctuations in single years, the average quantities per annum for three years ending with 1887 and 1897 respectively are compared. Those of animals for food must be presented in the separate items which are comprised in their group; while all classes of dead meat, except poultry and game (which are returned in value only), are grouped together, and butter and margarine are paired, as they were not distinguished before 1886. Condensed milk was not separately returned before 1888, and its quantity for that year is compared with the imports of 1897. Fresh milk was not distinguished before 1894, and as its quantity is insignificant, it is left out of account. Wool, the principal item in the total of "other imports," is given in the form of net imports, because we export so large a quantity of home and colonial wool that the figures representing gross imports would be misleading in relation to the progress of foreign competition. Eggs, included in the miscellaneous group, are given separately, as they make an important item in our animal food supply. The comparison, with the percentage increase or decrease in 1895–97, is given in the following table:—

The Movement of Certain Agricultural Imports in Ten Years.

Imports		Annual average, 1885–7	Annual average, 1895–7	Increase (+) or decrease (−) per cent.
Corn and flour	cwt.	142,427,500	191,919,200	+ 34·7
Cattle	no.	329,554	532,151	+ 61·5
Sheep	"	920,418	815,522	− 11·4
Pigs	"	19,916	108	− 99·5
Dead meat	cwt.	6,674,681	13,540,463	+ 102·9
Butter and margarine	"	2,540,729	3,961,275	+ 55·9
Cheese	"	1,801,837	2,327,317	+ 29·2
Condensed milk [1]	"	352,332	751,743	+ 113·4
Eggs	thousands	1,042,683	1,600,074	+ 53·5
Wool (net)	thousands of lb.	234,392	343,640	+ 46·6

[1] The imports of 1888 and 1897 compared.

Flour is reckoned in its wheat equivalents, and the total for corn and flour represents grain entirely, except for a small

proportion of meal. In the total for 1895–97 it was necessary to estimate the quantities of rye and buckwheat for 1897 as equal to those of 1896, as those of 1897 are not yet published; but the quantities are insignificant. It will be noticed that the increase in our imports of grain and flour in the ten years has been over 34½ per cent.; but a considerable proportion of the increase is that of maize and other feeding grain which, while competing with our home-grown corn, may yet be regarded as reducing the expenses of keeping horses and producing meat and milk.

It is clear that the most remarkable movement in agricultural imports is the vast increase in animal products. The increase in cattle is very heavy, in spite of the effect of our sanitary restrictions, which have reduced the imports of sheep and practically annihilated those of pigs. There is no doubt that, but for our port-slaughter and still more stringent restrictions in relation to certain countries, our imports of live stock would have increased enormously. As it is, the animals that would have come to us alive have come, for the most part, in the carcass form, in addition to the vast quantities of meat which would have been sent to us dead in any case. Thus we have to contemplate an increase of nearly 103 per cent. in our dead meat imports in ten years.

Turning to dairy products, the increase in butter and margarine is seen to be nearly 56 per cent. on the decade. It all relates to what is imported as butter, the supply of margarine under its proper name having diminished to a small extent; but there is no doubt that some margarine mixtures come in as butter. The augmentation in our foreign and colonial cheese supply is considerable, though in total quantity less than half that of butter and margarine. In percentage, the increase in condensed milk stands highest of any item in the totals. The egg supply, it will be noticed, has greatly expanded. Our net imports of wool also show a great advance.

It will be interesting to notice to what extent the prices of these imports have altered in the ten years. The declared value of the whole group of corn and flour averaged 6*s.* 9½*d.* per cwt. in 1885-87, and 5*s.* 5¾*d.* in 1895-97. The average value per head of the imported cattle was 16*l.* 15*s.* for each period, which shows that the increase in the number has not been in excess of the demand. The average per sheep was 38*s.* 3*d.* in 1885-87, and 31*s.* 4*d.* in 1895-7, the fall being mainly due to the fact that nearly all the sheep were from European countries up to 1887, whereas they have come almost exclusively from North and South

America during the last three years. But it is also to be borne in mind that the prices of inferior sheep have fallen slightly since 1887, though the values of prime sheep during the last three years have been about the same as they were in 1885-87. It is not worth while to compare the value of the few pigs imported in 1895-97 (all but four of which came in 1895) with that of the much larger number received at the earlier period.

The average price of all classes of dead meat together has fallen from 43*s*. 6*d*. per cwt. in 1885-87 to 37*s*. 4*d*. in 1895-97. There has been a fall in the price of each class of meat, without exception. The average price of butter imported in 1886 and 1887 (butter was not separately returned in 1885) was 5*l*. 5*s*. 7*d*. per cwt., and in 1895-97 it was 5*l*. 0*s*. 4*d*.; while that of margarine fell from 3*l*. 3*s*. 8*d*. to 2*l*. 13*s*. 10*d*. Cheese averaged 2*l*. 6*s*. per cwt. in 1885-87, and 2*l*. 4*s*. 3*d*. in 1895-97. In 1888, the first year of its separate enumeration, condensed milk was valued at 2*l*. 1*s*. 8*d*. per cwt., and last year at 1*l*. 17*s*. 2*d*. Eggs cost 2*l*. 16*s*. 11*d*. per 1,000 in 1885-87, and 2*l*. 13*s*. 3*d*. in 1895-97. Wool averaged 9 7*d*. per pound in the former period, and 8·2*d*. in the latter.

It will be seen that there has been a fall in the price of every group or separate commodity valued above, excepting cattle. In respect of all kinds of grain and flour together the fall is about one-fifth; in sheep, barely one-sixth; in all classes of meat together, one-seventh; in butter, one-twentieth; in margarine, over one-fourth; in cheese, one-twenty-sixth; in condensed milk, one-ninth; in eggs, one-twelfth; and in wool, one-eighth.

On previous occasions in this Journal[1] I have called attention to the decrease in the world's wheat and rye areas in relation to the population of bread-eaters, as demonstrated by Mr. C. Wood Davis, whose conclusions have been confirmed by Sir Robert Giffen in tabulated evidence brought before the Royal Commission on Agriculture. Mr. Davis has since perfected his table, 95 per cent. of his figures being official. In the *Forum* for October last he states that during the twenty-five years ending with 1896 the population of bread-eaters has increased from 371,000,000 to 510,000,000, or 37·5 per cent., while the increase in the area of breadstuffs has been only 7·6 per cent. The summary given by him appears on the next page.

The figures show clearly that the low prices of breadstuffs have caused their cultivation to decline relatively to the popu-

[1] Journal R.A S.E., 3rd series, vol ii. 1891, p. 742, and vol. vii. 1896, p 705.

lation. Indeed, an actual decrease is to be noticed since 1882. But the extraordinary series of productive harvests in the world at large from 1891 to 1895 inclusive had counteracted the relative decline in the acreage up to the end of the cereal year 1895-96, as indicated by the extremely low prices of wheat. The deficient world's crops of breadstuffs in 1896 brought a partial recovery in the price of wheat, and a more substantial advance has resulted from the still shorter production of 1897. It is obvious that the stress of competition has temporarily departed from the cultivation of breadstuffs, and that nothing but remunerative prices will revive it.

Grain	1871	1882	1896	Increase (+) or decrease (–) in 25 years
	Acres	Acres	Acres	Per cent
Wheat . .	125,800,000	150,000,000	158,000,000	+ 25 6
Rye . .	111,000,000	110,500,000	106,500,000	– 4 1
Spelt and maslin .	5,700,000	4,900 000	4,400,000	– 22 8
Buckwheat .	16,200,000	14,900,000	9,500,000	– 40 8
Total	258,700,000	280,300,000	278,400,000	+ 7 6

Unless our arable area should recover lost ground to a great extent, our imports of grain and flour must necessarily increase, and the only point to notice is that they have increased in spite of a fall in value. The case of wheat has already been explained. As to maize, it has never ceased to be a profitable crop in countries well suited to it. Oats at recent prices, on the other hand, have probably been produced at a loss in most countries, and in some there has been a decrease in the area of that cereal in the last year or two. The remunerativeness of barley depends upon whether a malting quality can be produced or not. However, the table giving quantities of imports shows that the great trend of foreign competition during the last ten years has been towards animal products.

That cattle should continue to be shipped to this country in growing numbers is not surprising, so long as the price keeps up. The most remarkable feature of the statistics is the vast augmentation in supplies of dead meat at a reduction of one-seventh in the average price. This is particularly the case with frozen meat, which has been selling at miserably low prices, as a rule, in recent years. The perseverance of our relatives in Australia and New Zealand in keeping up the trade in frozen mutton, when their net returns are frequently no better than boiling-down prices, is marvellous. The supply, together with that of dressed beef from the United States and

elsewhere, has probably kept our native meat from rising to almost famine prices; but it has not kept the prices of our prime beef and mutton from being maintained much better than the prices of commodities generally. All but the best meat, however, has been depreciated seriously by the tremendous foreign competition.

Again, with respect to dairy produce, the increase per cent. in which is much greater than that of corn and flour, we have also a fall in prices to consider. The fall in the price of imported butter—about 5*s.* per cwt.—may seem small, but it is over a halfpenny a pound, and that is quite enough to make the difference between profit and loss in some cases. It is very disheartening to see the imports of butter increasing, at a price which cannot fairly pay producers anywhere. The average of all the butter we imported worked out at 10·80*d.* per lb. in 1895, at 10·85*d.* in 1896, and at 10·60*d.* in 1897. Danish butter by itself came out for 1897 at 10·83*d.* per pound, or barely a farthing above the average on a bulk including the lower-priced butter of Holland, the United States, and our Colonies. It is a beggaring competition to supply the produce of 2½ gallons of milk at any such price, and nothing but the unremunerative results of corn-growing could have driven the Danes and Swedes into their increasing enterprise in this direction.[1] In all probability, even a moderate advance in the prices of corn would reduce our foreign supplies of butter.

In the case of cheese the figures show no considerable decrease in the price of the imported commodity. Recently the prices of American, Canadian and New Zealand cheese have been extremely low, the quotations having been 40*s.* to 42*s.* per cwt. for American, 42*s.* to 43*s.* for Canadian, and 40*s.* to 41*s.* for New Zealand—all described as "choicest," with lower prices for "inferior qualities." These rates are 17*s.* to 18*s.* lower than those of a year before, which seems to indicate that the imports have been too heavy for the demand. At the same time the finest Cheddar was quoted at 66*s.* to 70*s.*, and the finest Cheshire at 76*s.* to 79*s.*, thus showing how little the very best English cheese was affected in value by the superfluity of the imported produce.

[1] This opinion is, no doubt, open to controversy, but it was confirmed by all that I could learn during a recent visit to Denmark and Sweden, which led me to the conclusion that the small farmers could only pay their way by living more poorly than the generality of British farm labourers. Consular reports have stated that the low prices of corn first led to the devotion of more attention to meat production in Denmark, and afterwards, when the foreign markets for fat stock became less satisfactory than they had been, to dairying.

While the supply of condensed milk from foreign sources has more than doubled in ten years, the price has fallen considerably, though probably less than the price of fresh milk in our towns.

The price of imported eggs for the last three years is equivalent to nineteen to the shilling, and although there is much to be done in this country in improving the supply of new-laid eggs, it is impossible to compete with the foreign supply at such a price as that just named.

As to wool, it has been cheap for a much longer period than the one embraced in the calculations given above; and if it were not for the periodical droughts of Australia and Argentina, it would be very much cheaper than it is Fortunately, wool is a by-product in this country, our sheep being kept mainly for mutton; for there is every reason to expect that the supply of wool will go on increasing, with fluctuations, for many years to come, though in time the practically free land available for sheep will be encroached upon extensively for purposes of cultivation.

According to Mr. Davis, the area under wheat and rye, to say nothing of inferior breadstuffs, should be now at least 50,000,000 acres greater than it is in order to meet the requirements of bread-eaters, supposing an average crop to be grown; while the growth of population requires a further expansion of over 4,000,000 acres per annum to begin with, and a steadily growing increase above that area as the population continues to multiply. He makes no allowance for increased yield per acre, and probably he is right; for the cropping of inferior land with wheat may be expected for many years to counteract the effect of improved farming. At any rate, anything like such an enormous initial expansion in the wheat and rye area, and the steadily increasing yearly addition which he declares to be necessary, would have a great effect upon the production of meat, dairy commodities, and wool, or at least upon the cost of their production.

On previous occasions I have called attention to artificial restraints upon an advance in the prices of grain, and wheat especially. It is not my purpose to allude to those restraints on the present occasion, though it must be observed that the present price of wheat is exasperatingly low in view of the enormous deficiency in the world's production for the cereal year. But the wheat area must be greatly extended, and experience indicates that nothing but a substantial advance in prices will lead to that expansion; therefore the advance, though it may be hindered and kept lower than it would be

under fair conditions of trading and currency, cannot be prevented.

No branch of ordinary farming pays as well as corn-growing when prices are fairly remunerative, and therefore we may expect to see the stress of competition in meat and dairy produce relax if corn-growing once more pays moderately well. In the meantime, as shown by the prices of meat and dairy produce, the best hope of the rank-and-file of British farmers lies in the production of prime meat, milk for sale in the towns, "gilt-edged" butter for retail supply, and choice cheese; to which may be added the growth of fine malting barley where it is possible. Breeders are well aware of the fact that they must aim at the highest attainable approach to perfection in order to make good profits, and their efforts, by resulting in the production of animals of prime quality, and economical to feed or to use for dairy purposes, will materially help their customers to pay their way.

Lastly, it is to be observed, our legislators may fairly be called upon to wipe out, without further delay, the unjust competition to which our farmers have so long been subjected in respect of the sale of adulterated produce as genuine and imported goods as British, and in relation to preference railway rates on foreign commodities. It is a significant fact that the trend of foreign competition during the last ten years has been in the direction of those products which are most affected by one or both of the first two of the three handicaps upon home production just named. As there is hardly a product of this country which, at its best, is not superior to anything of the kind which we import, there is all the more reason why the unfair competition which artificially reduces the reward of the best production should be rigorously suppressed.

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BACON-CURING.

I.—PIG AND BACON STATISTICS.

BEFORE proceeding to discuss in detail the modern process of bacon-curing, and the best way to develop the latent potentialities of such a trade in England, it seems desirable to survey generally the sources from which we at present draw supplies, and to ascertain what prospect there is—if any—of a home industry becoming profitable in face of the huge imports which we

receive from foreign countries. It has become an accepted truth that we in England cannot produce enough bacon to supply our demand. It is a pity that it is so, because it is rendered the more difficult to make those most interested believe that our resources are greater than they assume. The object of this paper is to endeavour to put the matter on its proper basis, and to show precisely what can be done in the way of making bacon-curing a great industry in England. It is quite true that we can never hope to produce anything like the quantity of ham and bacon which we as a nation consume, but it is also the opinion of many who have taken the trouble to study the subject that we can very greatly extend our home production, both with advantage to agriculture and to the best interests of the kingdom. Bacon-curing is not an industry peculiar to any country. It depends upon the conditions under which agriculture is conducted, and the place that pigs are allowed to occupy in the economy of the farm. The mere technical details of curing are not the property of any country or of individuals. They can be acquired easily enough by those who are willing to learn, and there is a sufficiency of means for doing so always available.

One general fact should be borne in mind, and that is the close association between dairying and bacon-curing. No better example of this can be found than Denmark. That country is essentially a pastoral country, and has become famous for its butter. In the making of butter there is a large by-product in the separated milk—that is to say, the milk as drawn from the cow is deprived of its fat for butter-making, and the residue remains. It has been demonstrated that this separated milk is one of the best materials for feeding pigs, and, conjoined with such food stuff as barley, produces better bacon than can be obtained by any other method. The Danes have seen and acknowledged this truth, and as a consequence they have developed an enormous bacon trade. The same conditions are applicable to the United Kingdom, where, during late years, the dairy-farming business has made such great strides. But bacon-curing has not kept pace with it, and it must be assumed, in the absence of any evidence to the contrary, that British farmers do not yet, as the Danes do, recognise the close relationship between the dairy farm and the bacon factory.

The countries from which we derive our foreign supplies of bacon are not very numerous, although the quantities credited to some of them are enormous. The market of the world for bacon and pig products is England, and it is impossible to find a modern factory, say in Canada, or Denmark, or Sweden, which is not constructed with a view to supplying the English

market. It seems a pity that British farmers should stand indifferently by and see all this being accomplished.

The consumption of bacon and pig-meat in various forms has advanced by leaps and bounds during recent years, and the imports from foreign countries have correspondingly increased. In the twenty-two years from 1876 to 1897 inclusive, we see this rapid increase from the official returns, thus:—

Total Imports of Pig-meat into the United Kingdom.

Year	Cwt.	Year	Cwt.
1876	3,560,176	1895	5,861,388
1880	5,743,915	1896	6 563,688
1885	4,412,090	1897	7,315,613
1890	5,300,122		

Of the enormous import in 1897, no less than 5,004,915 cwt. was bacon, and its estimated value was 8,867,846*l.* The question therefore naturally arises as to whether we are compelled to be importers of bacon to the extent indicated, or if it is possible to produce any part of the quantity we require at home.

The first point to consider is the supply of pigs. In this regard the statistics which we here set forth are of interest and value. It is assumed that the bacon-curing countries are, in the order of their producing capacity—

1. The United States of America.
2. Canada.
3. Denmark.
4. England.
5. Sweden.

Of course, bacon comes from some other countries, but it does so in such small and varying quantities that for the purpose of general consideration we may overlook it.

Pig Statistics of the United States of America.

The principal source of our supplies of cheap bacon is the United States of America, and, according to an instructive United States Government return, there were in January, 1897, no less than 40,600,276 hogs in the forty-eight States, as shown in the table on the opposite page. It is of interest to notice the distribution over the States, and it would be instructive to trace the relation between the supply of food and the distribution of the hogs, but that cannot be done here.

Large as these figures undoubtedly are, it is noteworthy that there is a shortage of 2,242,483 as compared with 1896. The one deduction for us, therefore, is that if there is so great a diminution in the United States, there is so much more need for English farmers to raise hogs for English consumption. But

Estimated number of Pigs on Farms and Ranches in the United States of America, with average price at January 1, 1897, and total numbers and value.

States and Territories	Swine		
	Number	Average price	Value
		$	$
Maine	76,835	5.94	456,092
New Hampshire	55,272	8.97	195,790
Vermont	76,215	7.29	555,791
Massachusetts	58,297	8.44	492,025
Rhode Island	14,289	7.00	100,024
Connecticut	53,737	9.29	198,999
New York	632,524	6.61	4,181,932
New Jersey	153,437	8.02	1,230,872
Pennsylvania	1,022,773	6.67	6,822,816
Delaware	49,559	5.80	287,443
Maryland	331,886	6.74	2,237,741
Virginia	995,605	3.38	3,361,161
North Carolina	1,455,892	3.11	4,524,475
South Carolina	1,096,968	3.49	3,830,172
Georgia	2,012,868	3.17	6,378,514
Florida	415,017	2.02	837,504
Alabama	1,885,876	2.53	4,763,724
Mississippi	1,998,978	2.40	4,790,752
Louisiana	790,961	2.83	2,235,255
Texas	2,944,065	2.18	7,301,281
Arkansas	1,375,586	2.32	3,190,861
Tennessee	1,796,104	3.33	5,978,152
West Virginia	371,292	4.25	1,577,100
Kentucky	1,604,164	3.34	5,359,192
Ohio	2,284,662	4.93	11,273,436
Michigan	713,487	5.91	4,220,277
Indiana	1,340,365	5.05	6,762,409
Illinois	2,249,401	5.18	11,651,896
Wisconsin	902,507*	5.38	4,859,097
Minnesota	521,090	4.91	2,560,977
Iowa	3,737,970	5.67	21,182,330
Missouri	3,074,329	3.99	12,269,648
Kansas	1,659,722	4.61	7,648,165
Nebraska	1,263,931	4.77	6,026,422
South Dakota	158,463	4.39	696,128
North Dakota	120,308	4.50	541,385
Montana	51,045	7.87	401,186
Wyoming	17,734	4.52	80,122
Colorado	22,716	4.54	103,131
New Mexico	31,151	4.85	151,113
Arizona	26,076	4.84	126,208
Utah	53,790	5.45	293,382
Nevada	11,126	5.09	56,653
Idaho	75,192	3.69	277,721
Washington	210,683	3.32	700,310
Oregon	240,051	2.37	567,864
California	487,163	4.13	2,013,738
Oklahoma	78,514	4.08	320,141
Total, 1897	40,600,276	4.10	166,272,770
Total, 1896	42,842,759	4.35	186,529,745
Decrease in 1897	2,242,483	.25	20,256,975
Decrease (per cent.)	5·2	5·7	10·9

we shall see that the diminution is not confined to the United States alone, for in Europe also there is a great falling off.

Pig Statistics of the Dominion of Canada.

The most recently published figures for the Dominion of Canada are given below. In addition, I am able to record the results of the most recent census in three of the provinces, which are interesting in comparison with former years' totals.

Statement of the number of Swine in Canada, as given in the Census Returns of 1881 *and* 1891.

Provinces	Swine 1881	Swine 1891	Increase (+) or Decrease (—)
Ontario	700,922	1,121,396	+ 420,474
Quebec	329,199	369,608	+ 40,409
Nova Scotia	47,256	48,048	+ 792
New Brunswick	53,087	50,945	— 2,142
Manitoba	17,358	54,177	+ 36,819
British Columbia	16,841	30,764	+ 13,923
Prince Edward Island	40,181	42,629	+ 2,448
The Territories	2,775	16,283	+ 13,508
Total	1,207,619	1,733,850	526,231

Professor James Robertson, Dairy Commissioner, informs me that the following are the figures arrived at by the provincial authorities of the three provinces named. There are no means for checking the returns from the other provinces:—

Province.	Year.	Number of swine.
Ontario	1897	1,284,963
Manitoba	1897	74,944
British Columbia	1894	25,290

It is safe to say that the coming rival of all other countries in the production of bacon is Canada. The attention given to the breeding of pigs by the agricultural authorities and the enthusiastic co-operation of the farmers are alike contributing to this result. "Pea-fed Canadian" is fast displacing Danish meats and taking the leading place in the English market. No doubt the supplies from Canada will continue to increase by the same leaps and bounds as of late years, so long as the Dominion farmers devote as much attention to the *quality* of hog produced. It is said now that one house alone in Canada often kills as many hogs in one week as the whole of the Danish slaughteries. It will be noticed that there is a large increase in the number of hogs bred in 1891 as compared with 1881, and a still greater increase, at least in two of the provinces, in the year 1897.

Pig Statistics, also Ham and Bacon Statistics, of Denmark

Denmark has undoubtedly been our chief source of supplies of high-class bacon till within a year or two ago. Canada has come so rapidly to the front that there is but little doubt that the supplies from thence have injuriously affected the market

Fig. 1.—Danish Boar from Holstebro, a descendant of stock introduced into Denmark [illegible] by the late Magnus Kjaer

for Danish meats. Denmark itself is a bacon-curing country of only recent growth, as the following statistics show :—

Number of Pigs in Denmark.

Province	1838	1861	1866	1881	1888	1893
Islands . . .	163,341	188,778	225,545	285,317	398,518	456,819
Jutland . .	71,950	112,150	155,967	242,100	372,267	372,812
Total	235,291	300,928	381,512	527,417	770,785	829,131

Since 1890 Denmark has not sent any live pigs to England, but has gone on increasing from year to year her exports of bacon. As it is to Denmark as a model that the British farmer ought to look, the detailed figures showing the growth and development of Danish bacon-curing are worth giving :—

Total Export of Bacon and Hams from Denmark.

Year	lb
1890	59,084,270
1894	92,843,457
1895	121,790,311

When the export of live pigs from Denmark was stopped in 1890, the farmers had to adapt themselves to the new conditions. They therefore formed themselves into co-operative societies, and built bacon factories throughout the country. The total number of such factories at present is forty-one, of which nineteen are private, and twenty-two belong to farmers' coöperative societies. We shall deal subsequently with the exact constitution of these co-operative societies.

It is somewhat difficult to get at the census of pigs in Denmark, but it is stated on good authority that the total has diminished very considerably. The number of pigs slaughtered for bacon averaged, three years ago, about 22,000 to 25,000 weekly: the average of 1897 will not exceed 17,000 per week. The causes of this great decrease are principally in connection with the shortage of food and the increased price of Indian corn, barley, and other food-stuffs. Denmark is entirely an importing country for the food supplied to swine and other live stock, and a very slight increase of price shows its effect at once. Of course, the basis of all the food for Danish pigs is separated milk, as produced at the numerous dairies and butter factories, a by-product which can hardly be utilised in Denmark for any other purpose.

Pig Statistics of the United Kingdom.

England, as a bacon-curing country, really occupies a very inferior position. We are consumers of enormous quantities of bacon and hams, and it is astonishing that so few factories exist amongst us. The natural conditions are suitable to the growth of pigs, and food is plentiful. In the United States the food is mostly Indian corn. In Canada it is to a large extent pea-meal, and hence the fine firm quality of the meat. In Denmark and Sweden the food is imported—Russian or other barley, &c. In fact, Denmark, from its small size and the character of its land, cannot produce the food required. A strong incentive to the development of the pig industry in that country was, as we have said, the necessity for using up the separated milk from the dairies. But separated milk alone will not make bacon, and it is necessary therefore to import food—Indian corn and barley. Nevertheless, under these adverse conditions the Danes have made this business a profitable one, and one of the leading industries also. In Denmark all classes are interested in growing pigs, from the extensive land-owners to the cottars. The farmers' societies throughout the country make the study of the pig and how to get most profit out of it the leading topic

Number of Pigs in England, Wales and Scotland on June 4, 1897, with a comparative statement for 1896.

Counties	Pigs 1897	Pigs 1896
	No.	No.
TOTAL FOR GREAT BRITAIN	2,342,302	2,878,801
ENGLAND . .	1,990,534	2,476,188
WALES . .	216,447	257,698
SCOTLAND . .	135,321	141,615
ENGLAND		
Bedford . .	25,135	31,658
Berks . .	24,590	34,484
Buckingham .	29,760	40,155
Cambridge .	49,818	58.555
Chester . .	66,222	75,034
Cornwall .	76,816	102,381
Cumberland .	20,513	23,901
Derby . .	29,021	38,923
Devon . .	92,633	120,928
Dorset . .	52,413	66,288
Durham . .	11,122	13,801
Essex . .	90,559	113,250
Gloucester .	68,416	83,993
Hants . .	67,329	88,097
Hereford .	23,294	31,109
Hertford .	25,976	34,329
Huntingdon .	18,595	22,650
Kent . .	57,135	69,706
Lancaster .	53,149	61,870
Leicester .	21,397	33,291
Lincoln . .	96,121	117,616
London . .	2,939	3,475
Middlesex .	13,535	15,058
Monmouth .	14,585	19,010
Norfolk . .	96,596	117,903
Northampton .	27,590	38,150
N'rthumb'rl'nd	10,256	12,687
Notts . .	27,077	35,155
Oxford . .	32,053	43,625
Rutland . .	2,153	3,031
Salop . .	59,519	71,787
Somerset .	119,475	137,154
Stafford . .	46,164	62,866
Suffolk . .	146,412	165,636
Surrey . .	22,006	28,333
Sussex . .	40,293	48,917
Warwick .	36,629	48,782
Westmorland .	3,999	5,057
Wilts . .	67,154	79,830
Worcester .	40,723	50,589
York, E. Riding	51,209	62,551
" N. "	46,676	59,735
" W. "	79,877	101,808

Counties	Pigs 1897	Pigs 1896
	No	No
WALES		
Anglesey . .	15,499	18,169
Brecon . .	8,213	9,914
Cardigan . .	21,722	24,763
Carmarthen .	33,570	39,390
Carnarvon .	21,437	22,905
Denbigh . .	25,642	30,321
Flint . .	16,175	19,830
Glamorgan .	15,298	19,295
Merioneth	7,957	9,564
Montgomery .	20,299	25,580
Pembroke .	25,845	32,429
Radnor . .	4,790	5,538
SCOTLAND		
Aberdeen . .	10,721	11,461
Argyll . .	4,472	4,380
Ayr . . .	15,376	14,776
Banff . .	2,696	2,986
Berwick . .	3,632	4,318
Bute . .	788	935
Caithness .	1,516	1,790
Clackmannan .	2,122	2,744
Dumbarton .	1,604	1,605
Dumfries . .	9,239	10,636
Edinburgh .	6,545	7,291
Elgin, or Moray	2,767	2,921
Fife . .	5,482	5,955
Forfar . .	6,672	7,272
Haddington .	1,654	2,068
Inverness .	2,617	2,763
Kincardine .	2,470	2,624
Kinross . .	410	499
Kirkcudbright .	6,695	7,284
Lanark . .	7,517	7,540
Linlithgow .	1,380	1,767
Nairn . .	722	683
Orkney . .	2,850	3,845
Peebles . .	630	705
Perth . .	7,769	8,228
Renfrew . .	1,507	1,591
Ross and Cromarty .	5,101	5,360
Roxburgh .	3,282	3,730
Selkirk . .	496	445
Shetland . .	2,895	2,918
Stirling . .	2,410	2,479
Sutherland .	963	1,049
Wigtown . .	10,291	9,967

for discussion. It will be a good day for England when a similar spirit is evinced here.

In the Table on the preceding page the totals of pigs, as returned last year for Great Britain, are recorded. The total number of pigs in Ireland in 1897 was 1,327,326, showing, as compared with 1896, a decrease of 77,360. The total decrease in 1897, as compared with the preceding year, appears, therefore, to be as follows :—

	No
Decrease in Great Britain	536,499
" " Ireland	77,360
Total decrease in United Kingdom . . .	613,859

The tabulated figures show clearly that we have in England a fairly general distribution of pigs. Their movement from one place to another has been much impeded by the swine fever regulations, and as a consequence many farmers have stopped breeding altogether. Factories are so far apart that should any area be declared "infected" it means immense sacrifices on the part of pig breeders. The obvious and only remedy is to have factories more uniformly distributed. The farmer would then be independent of any regulations, and have greater encouragement to produce bacon pigs.

Pig Statistics of Sweden.

Perhaps nowhere are the figures relating to the breeding and growing of hogs for bacon more instructive than in Sweden. There are eight export bacon factories in that country, all well equipped with appliances and accommodation for the turning out of immense quantities of bacon. Since 1890, the Swedish Government has, in its wisdom, adopted protective tariffs on food stuffs, and so practically destroyed the industry. It is interesting to follow the course pursued by the Swedish Government, as it is an object lesson to all who care to learn it. In 1890 the bacon industry was in a flourishing condition in Sweden when the first prohibitive tariff was imposed on food stuffs. From that year up till now the stringency of these tariffs has been increased until, at the present moment, the bacon factories are practically idle. The duties on maize, barley, beans and peas are 1*s.* 10*d.* per cwt. When it is considered that this figure represents sometimes about 50 per cent. of the value of maize, it is obvious how high the duty is, and how prohibitive must be its effect. The object is, of course, to benefit the farmer, but to a mere onlooker it is not very evident how this is achieved. Sweden grows mainly rye and oats, and of these the latter only is of any value as pig food. In 1897, the oat crop was a failure, and the feeders of

pigs are therefore stopped, as although there is plenty of separated milk, it does not pay to import food in face of the heavy duties. Sweden, it may be observed, is not a consumer of high-class bacon, the cheaper American kinds being most readily saleable there, and the best quality of Swedish produce being shipped to London. The present Swedish duty on American bacon is 11*s.* 4*d.* per cwt., and, of course, such an import duty has curtailed that trade enormously. It is obvious that the farmers must now grow pigs for the poorer people—that is, big fat pigs—or cease growing them altogether. It is also obvious that the cheapest form of food for poor people, viz bacon, is being made prohibitively dear, and that the burden will fall upon the poor almost exclusively.

Sweden can no longer export bacon with the present arrangement of the tariff, and there can be but little doubt that the bacon industry there is a dwindling one. It must ultimately die out under present conditions. The following figures show the exports to England since 1891:—

Exports of Bacon from Sweden to England, 1894 to 1897.

Year	Cwt	Year	Cwt.
1894	175,000	1896	140,000
1895	191,500	1897	70,000

Bacon imported from Other Countries.

The other countries which produce bacon and export it to England are Holland and Russia. A small quantity comes from Belgium, and still smaller quantities from Germany and Norway. Australasia contributes only a very little for the time being. But these importations do not add much to the total, and in general calculations they may be disregarded. It is said that the Russian Government propose to devote a considerable sum to the fostering of a native industry of pig growing for bacon. If this should be the case there will first require to be a very marked improvement in the quality of the hogs before any success in England can be attained with the bacon.

II.—The Formation of Bacon-curing Companies, with the Names of Places at which it is Proposed to Construct Factories.

The Danish farmers' co-operative societies are the best models for British farmers to follow in forming similar limited companies. It will be remembered that the great expansion of the Danish trade in bacon began at about the same time as the farmers' societies were formed for the purpose of constructing factories for bacon-

curing. The first of these factories was established in 1887 at Horsens, under the able directorship of Mr. Paul Norgaard (now joint proprietor of Holstebro Svineslagteri and others). This factory was the means of teaching the farmers what they could do for themselves, with the consequence that, since that date, the whole of Denmark has become dotted over with bacon factories. The number, as has been stated, is forty-one, and in all likelihood this total will yet be added to, in spite of the apparent falling off in the supply of hogs.

Most of these bacon factories now make provision for the slaughtering of cattle as well as hogs. The cattle carcasses are largely exported, in sides, to London and Hamburg, and it is thought that the trade may become a remunerative one in conjunction with the bacon business.

It has been the author's privilege to visit most of the bacon factories in Europe, and he is in a position to testify to the splendid organisation of the Danish farmers and their successful manner of conducting these factories. The factories themselves are models of economic construction, and are generally under the directorship of an able manager skilled in all the details of the business. Cleanliness and economy seem to be the rule everywhere.

The manner of forming a farmers' association for the purpose of carrying on a bacon-curing business may be briefly described —as it has already been done in the author's "Receipt Book" and elsewhere—as follows :—

The funds for the erection of the necessary buildings were generally derived from a loan effected on the security of the founders, each member being expected to become a guarantor for an amount not exceeding 50*l.*, the sum guaranteed by each individual determining the extent of his ownership in the concern.

The administration of the association is vested in a council elected by the members. The employés usually consist of a manager, a book-keeper, and a cashier. The regulations of the different co-operative bacon factories agree very much in their general principles. It is usually stipulated that the members of the association shall deliver all their saleable swine to the factory for a period of seven years, except in the case of removal from the district. This stipulation, however, does not apply to boars, to sows in farrow, or to young pigs under 56 lb. (in some cases 112lb.) live weight, nor does it extend to pigs sold by a member to his labourers, or consumed in his own house. A corresponding obligation is nearly always imposed on the association to accept all the healthy swine consigned by a member to the factory. A member may purchase any number of pigs from another member of the association, and send them to the factory, provided he has fattened them for a period varying from twenty to thirty days before delivery, but he is not allowed to send in one year more than ten pigs purchased from non-members.

The association usually defrays the expenses incurred in conveying the swine from the nearest railway station to the factory; all other charges for

carriage are paid by the consignors. On removal to the factory the pigs are divided into classes according to quality, the values of the different classes being fixed weekly by the council on the advice of the manager. In some cases the prices are paid by dead weight, but in the older establishments, payment by live weight is still in practice. The offal is generally sold to the members of the association, or to the general public at the current prices of the day. The regulations do not, as a rule, contain any restrictions on the methods of feeding swine intended for the factories. Sometimes, however, the employment of fish and fish cake is prohibited, as is also the use of a ration containing more than 50 per cent of maize. Whenever it is found that the supply of swine is falling off, the manager of the factory is empowered to purchase pigs from non-members of the association at a price fixed weekly by the council, and posted up for the information of members.

At the close of the year the profits arising from the operations of the association are distributed amongst the members, after provision has been made for the payment of the working expenses, the allocation of a certain sum to the reserve fund, and the part repayment of loans. Each member receives a share of the profits in proportion to the weight of pork he has delivered during the year. The amount carried to the reserve fund is determined annually by the council. In some of the Danish co-operative bacon factories it is the practice to elect the members of the council as representatives of the members residing in different parishes. Thus, in the rules of the Esbjerg factory, it is provided that any parish in which ten members of the association reside may be represented by a delegate on the council. The president is chosen by the council from amongst themselves.

Of late the question has been discussed at meetings of the directors of the various factories whether it would not be better to amalgamate the whole of the factories and have one general sale office in London. At the present time the bacon is distributed by agents who are principally located in Hibernia and Wellington Chambers, London Bridge. These agents, of whom there is a considerable number, get three per cent. for selling the bacon, and for this percentage they take all risks of bad debts. The bacon is consigned to the agents as it becomes ready, and it is their duty to obtain the best price they can for it. This price, less expenses of landing, storing, telegrams, commission, &c., is remitted at once to the factories.

In England it is possible that a modification of the Danish scheme might be successfully carried out. The one thing necessary would be that the farmers should guarantee so many pigs per annum. The difficulty would be the regular supply of pigs but this difficulty could be got over by arrangements. Let it be clearly understood that the factories will take all pigs offered at prices fixed by responsible shareholders. Let the factories distribute in various districts well-bred boars free, and so encourage the breeding of good pigs, and there seems little doubt but that success would follow any well-considered scheme. The nearest approach to anything like a farmers' factory in England

is the factory now being constructed for the Yorkshire Bacon-curing Company, Limited, at Selby, Yorks. The idea of this factory was conceived by Mr. H. L. Chowen, agent of the Earl of Londesborough, upon whose estate the factory is situated. It was intended primarily to help the farmers on his lordship's estates, and there is very little doubt but that great success awaits it.

Some of the more important features of the prospectus of the Yorkshire Bacon-curing Company, Limited, may be with advantage reproduced here, as serving to show the lines which might be followed in the origination of similar concerns. The capital was 35,000 ordinary shares of 1*l.* each, of which 20,000 were offered for subscription at par on June 10, 1897, the date of publication of the prospectus:—

1. This Company has been formed to acquire Freehold Land at Selby, in the West Riding of Yorkshire, and to erect and equip thereon a Factory for curing Bacon in the "Wiltshire" style, and for the production of real "York" Hams. *The want of such a Factory for a home industry, and the production of an article which is in every day use, has been long felt.* Yorkshire, the largest pig-producing county in the United Kingdom, is still without the means to manufacture the celebrated Hams which are sold throughout this country and abroad as prime York Hams. The deservedly high reputation of York Hams is in itself a species of goodwill, and the Directors, with other gentlemen in the neighbourhood interested in agriculture, have associated themselves together with the object of promoting this industry in Yorkshire, so that some portion of the profits derived therefrom may be retained in the County from which the Hams take their name.

2. The demand for Mild-cured Bacon and "York" Hams is very extensive, but for the production of these it is necessary to have a Factory fitted up with the most modern appliances in general use in Wiltshire, Ireland, and Denmark. The new Factory will be so equipped, and it is expected will be in operation in December, 1897.

4. In connection with the Bacon-curing Industry there are a considerable quantity of bye-products, which are worked up into sausages, brawn, potted meats, polonies, &c., &c., and no better market exists for these than the populous industrial centres of Yorkshire, all of which are within easy reach of Selby.

5. Selby is exceptionally well situated as a centre for the Bacon and Ham-curing Industry, being on the Main East and West Line on the North-Eastern Railway between Leeds and Hull at the point where it is intersected by the North and South Line between London and Scotland. It is served by the London and North-Western, the Great Eastern, the Great Northern, and North-Eastern Companies, and, owing to the water competition, the rates for carriage of produce to the large manufacturing towns of Yorkshire are exceptionally low. The town is situated on the west bank of the River Ouse, which is navigable to vessels of 350 tons. There is also, by means of a branch of the Aire and Calder Canal, direct water communication with the neighbouring Colliery Districts and the West Riding and Lancashire. The surrounding district is exceptionally well stocked with pigs. The Board of Agriculture state that within a radius of 15 miles of Selby there were 30,752 at June 1896 (the last census taken). The total number of pigs alive in Yorkshire a returned by the Board of Agriculture on June 4,

1896, was as follows,—East Riding, 62,551; North Riding, 59,735; West Riding, 101,808; total, 224,094.

6. The estimate of profits has been carefully made upon expert advice. The factory has been designed with a view to expansion, but it is computed that a moderate estimate of the trade to be done from the commencement of the enterprise is an average of 300 pigs per week, and after providing for all expenses in connection with the Factory, including depreciation of buildings, machinery, &c., leaves an average net profit of 5*s.* per pig. *This would yield* 3,900*l. per annum, a very remunerative return,* 2,000*l. being equal to* 10 *per cent. upon the capital called up.* The saving in carriage alone on 3,000 pigs per week by the manufacture at Selby would amount to over 1,000*l.* per annum.

7. The Directors are in a position to state that the services of a thoroughly competent and experienced Manager can be secured.

8. The following is a Report by Mr. Loudon M. Douglas, of the firm of William Douglas & Sons, Bacon Factory Engineers, 29, Farringdon Road, London, E.C., to which is added an independent Report obtained by Messrs. Douglas from a practical Bacon Factory Manager:—

"24th March, 1897.

"The first thing to be considered in the promotion of an industry, such as Bacon-curing, is the supply of pigs. Yorkshire is the largest producing county in the United Kingdom. The figures for the year 1896, as obtained from the Board of Agriculture, show the total number of pigs alive on June 4th was 224,094.

"The only county that comes any way near this large total is Suffolk, with 165,636—all other counties are very far behind. It seems rather anomalous that amid this great produce there should be no Bacon or Ham Factories. There are, of course, numbers of Pork purveyors, who do a lucrative business in their own special way, but the Factory proper, as known to other parts of England, especially the West, is wholly unknown in the county of York. From time immemorial the name of 'York' Hams has been synonymous with a high-class product, and on the Continent at the present day Hams sold under that name may be met with in thousands, particularly in France. It is safe to say that few, if any of these, ever saw Yorkshire, and indeed it is common knowledge that most of them are prepared in the great factories of Ireland. It seems, therefore, reasonable to suppose that so far as Hams are concerned, no difficulties would arise in disposing of them. The same remark applies to bacon. The modern method of curing Bacon as 'Mild-cure' is unknown in Yorkshire, and the small curers there still adhere to the obsolete method by which the meat is overcharged with salt and not only made unpalatable but in many districts practically unsaleable. The introduction of the modern way of curing would very speedily cause the demand for York Bacon and Hams to bound up enormously. Selby as a centre seems well suited for the proposed Factory as it is on the main line North and South, and within easy access to a great many large and flourishing industrial centres. The importance of situation cannot be too much amplified, as the fact of being near to large centres of population is itself a warranty of the easy disposal of the offal. The requisite conditions in starting a Bacon Factory are as follows:—

1. An ample supply of pigs.
2. A site where there is plenty of Water and a Railway.
3. Sufficiency of Capital.
4. A competent Manager.

"A fairly large factory would be one to handle about 300 pigs per week, and this is only 15,600 per annum, or roughly speaking, one-fourteenth of the available supply."

Messrs. Douglas have obtained the following Report from a thoroughly practical Bacon Factory Manager on whom they can rely:— [illegible]

"17th March, 1897,

"With reference to your letter as to a proposed Bacon Factory at Selby, I find that you are quite right as to the very large supply of pigs in Yorkshire. I had no idea of its being so large till I looked it up, and my only wonder now is, that a Bacon Factory or Factories have not been started there before, especially as 'York' Hams have a long-established name in London and on the Continent. On looking at the position of Selby on the map, I find that it is situated in a most advantageous point for the distribution of Goods, having a good communication with London and being also within about 60 miles of the following large towns, having populations as under:—

Manchester and Salford	740,268	Bolton	120,380
Leeds	402,449	Burnley	102,805
Sheffield . . .	347,278	Huddersfield	100,463
Bradford	228,809	Halifax	94,775
Hull	220,844	York	67,004
Oldham	143,442	Total	2,568,517

not to mention the numerous smaller towns. This district is one of the largest bacon-consuming parts of England, and *a very large proportion of the bacon produced by the West of England and Wiltshire Factories is sent there* to be disposed of, costing them on an average about 50*s.* per ton for freight, and as the freight for, say, 60 miles round Selby as charged by the North-Eastern Railway Company would not average more than 10*s.* to 20*s.* per ton, the saving on freight alone would amount to a very large item indeed.

"This is also a splendid district for the sausage trade, which is a most lucrative business—also for disposing of the offals, cuttings, plucks, &c., in the surrounding large towns, at good prices. A depôt might also be arranged for collecting agricultural produce, such as butter, eggs, poultry, &c."

A modern bacon factory is a place which is devoted to the manufacture of bacon as its first business. There are subsidiary businesses which may be, and are, generally carried on in bacon factories, such as sausage making, pork-pie making, &c. But the distinction must be clearly drawn, on the foregoing lines, between a bacon factory proper and an ordinary pork-selling business. There are many thousands of the latter in England, but these places could not be correctly described as bacon factories.

Bacon factories proper are situated at the following places in England:—

Redruth, Cornwall	Stroud, Gloucestershire
Highbridge, Somerset	Oxford, Oxfordshire
Calne, Wiltshire	Reading, Berkshire
Chippenham, Wiltshire	Andover, Hampshire
Trowbridge, Wiltshire	Wroxall, Isle of Wight
Malmesbury, Wiltshire	Needham Market, Suffolk
Gillingham, Dorset	East Dereham, Norfolk
Cirencester, Gloucestershire	Birmingham, Warwick (4 factories)
Nailsworth, Gloucestershire	Selby, Yorks
Bristol, Gloucester (4 factories)	Carlisle, Cumberland

The total output of these factories is a fraction only of the consumption of bacon. English-cured bacon commands still a much higher price than any foreign-cured meats, and, so long as

attention is given to the breeding of the pigs, so long will that advantageous state of things exist. There seems, therefore, every prospect of success awaiting factories which may be started in the future.

This is a matter for the earnest consideration of all agricultural societies, and the sooner they recognise its vast importance the sooner will better profits from agriculture be obtained.

Suitable Districts for New Factories.

The question next arises as to what districts would be most suitable for bacon-curing establishments. After much deliberation and from personal acquaintance with every county in England, the author has compiled the following list of places where, in his opinion, factories might be established with advantage. These districts are:—

Bangor	Colchester	Lincoln
Bedford	Exeter	Nottingham
Cambridge	Gloucester	Portsmouth
Cardiff	Hereford	Ripon
Cheshire	Lancaster	

Among the points to be considered in establishing a bacon factory are the following:—

1. The supply of bacon pigs.
2. The facilities for transport.
3. The water supply—it must be good.
4. Easy access to populous districts so as to get rid of offal at a profit.

The bacon factories in England, it is curious to state, lie mostly in the south. In fact, a straight line drawn from the mouth of the Thames to that of the Severn would cut off most of them. The reason of this is not quite clear. It certainly does not lie in the supply of pigs, as the Wiltshire factories do *not* get their supplies in that county. Owing to the good cross-channel service, a large proportion of the pigs for "Wiltshire" bacon are brought from Ireland! Of course, in addition to that source of supply there are the adjoining counties. The real reason is doubtless the energetic enterprise of the owners of these bacon factories.

III.—The Equipment of a Modern Bacon Factory.[1]

The modern method of curing is very simple. It is dependent to a large extent upon mechanical appliances of various

[1] The author has in course of preparation an illustrated article dealing with the construction and equipment of modern bacon factories, which will give fuller details than are here set forth. This article it is hoped to publish at an early date in the Journal.

kinds in the first place, and on the use of salt and other preservatives in the curing process. Time was when farm-cured bacon of a very coarse quality was made to a large extent all over the United Kingdom. The curing of such meat has, however, almost ceased within late years, although in some of the remote districts it is still carried on. The fatal objection to farm-cured meat is that it cannot be produced except in a very salt state, and the taste for such meat is becoming rarer since modern processes for producing mild-cured meats were introduced. A modern factory consists of a building suitably separated into departments, and so arranged that there will be no loss of labour. The main departments may be set down as:—

Slaughtering house	Boiler house
Dressing room	Smoke houses
Chill room	Baling loft
Cellar	Offices
Engine and refrigerator rooms	

The subsidiary departments consist of:—

Sausage department	Lard refining department
Pie department	Bone digesting and grinding department
Canning department	

There are many appliances, some of them of an ingenious character, placed in these various departments. First in importance is the refrigerating machinery, without which a modern bacon-curing factory would be incomplete. There are many systems of refrigeration,[1] but few lend themselves to the purposes of a bacon factory, inasmuch as besides requiring a circulation of air in the chill rooms it is indispensable to have a large amount of "cold" stored. Two gases are used as refrigerants, viz. ammonia and carbonic acid. Ammonia is objectionable because of its smell and dangerous properties, and would not seem to be so adaptable to the purposes of a bacon factory as carbonic acid (carbon dioxide). Carbonic acid has no smell, and it is capable of being used in a machine to which a safety valve is attached. The other appliances to which special consideration must be given are the singeing stack (which should be of the vertical type), the pickle pump, and the lard appliances.

It would be of very little present interest to detail here all the appliances necessary in a modern factory; suffice it to say that the equipment of factories may be accomplished for a small sum, which may rise to very large amounts according to

[1] See *Cold Storage: its Principles, Practice, and Possibilities.* By Dan. Pidgeon, Assoc. Inst. C.E., Journal R.A.S.E., 3rd series, Vol. VII. (part iv.), 1896, pp. 601–617.—Ed.

the work to be done. As a guide it may be useful to state that factories may be built and equipped for the undernoted sums, excluding price of land:—

						£
A factory to handle say			50 pigs per week, about			700
"	"	"	100	"	"	" 1,500
"	"	"	300	"	"	" 5,000
"	"	"	500–1,000	"	"	" 12,000
"	"	"	1,000–2,000	"	"	" 15,000

These estimates are based upon work actually done. The figures bear no relation to one another, as it depends very much on local conditions as to levels, &c., what the cost may be.

IV.—Modern Bacon and Ham Curing.

The great strides made in the business of bacon-curing during recent years and the constant developments that are taking place render it necessary that from time to time the process of curing, as modified and brought up to date, should be described in some periodical accessible to everyone.

The process of curing is simple enough, consisting as it does for the most part of adding preserving substances to the meat and allowing time for such materials to saturate the tissues. This preserving process checks the development of bacteria, and renders it possible to keep bacon, and other meats similarly treated, for an indefinite period.

For the purpose of slaughtering and preparing the animals for the cellars, the pigs are hoisted by means of a friction hoist driven from the main driving shaft of the factory, by one of the hind legs, to an overhead bar. The moment they reach this bar the slaughterman passes a sharp knife quickly into the neck through the jugular vein, and in the direction of the heart, but withdraws it instantly. The pigs bleed quickly and suffer very little pain. They are immediately pushed along the track bar to the bleeding passage, and are allowed to hang till all the blood has flowed from them. They are then flung on a dumping table, and the leg chains are removed. They are at once rolled into a scalding vat, nearly filled with water at 180° F. The carcasses are rolled in this vat until the hair and bristles come away easily in the hand. They are then hoisted by means of a "cradle" on to a scuttling table, where the remains of the hair and bristles are removed by means of bell-shaped scrapers. They are next swung by an oblique board on to the track bar again, and are brought to the singeing furnace, in which they are singed for about a quarter of a minute, lowered again to the track bar, and plunged into a cold bath, from

which they are immediately hoisted to the track bar again, and while sprays of cold water are playing upon the carcasses, the latter are scraped by means of flat hand-scrapers free from the burnt surface. The intestines and offal are then removed and sorted in various departments, and the carcasses, after again being cleansed, are split down the back, the vertebral column removed, and the two sides, including the vertebral column, the head, the feet, and the flick lard or kidney fat, are weighed. This is what is known as "dead weight" (see fig. 2), or the weight upon which payment is made (the dead weight of a hog weighing alive 16 stones would be 12 stones). From the dead weight it is the universal custom to deduct 2 lb. per side for beamage,[1] and the price then is the price of the nett weight. After the weight is ascertained the head and fore feet are completely severed, the kidney fat and vertebral column are removed, and the sides are disconnected and allowed to cool in the hanging-house for a period of from six to twelve hours according to the time of year. They are then placed in a chill room for about twelve hours, until the meat registers on a meat-testing thermometer 40° F. This temperature is obtained by keeping the chill rooms at 38° F. The blade-bones are now removed, and the sides trimmed and taken to the cellars.

Wiltshire Bacon.

On being taken to the cellars the sides are laid on a bench and pumped at a uniform pressure of about forty pounds per square inch, at the places indicated in fig. 3, with a pickle made from the formula :—

	lb.
Salt	50
Granulated saltpetre	5
[2] Dry antiseptic	5
(Cane sugar, in winter only	5)

To this add 20 gallons of water and stir till all the material is dissolved. The strength as shown by the salinometer should be about 95°. If such is not indicated, add salt and stir until it is.

---

[1] "Beamage" is the deduction made in weighing pigs warm. The moisture which evaporates before the flesh becomes rigid is estimated at 2 lb per side, or 4 lb. per pig all over. It is the universal custom for bacon-curers to deduct this amount

[2] "Dry antiseptic" consists of boracic acid neutralised with borax. The mixture is dried and concentrated at a high temperature. At the same time chemical combination takes place, and the resulting compound is nearly 3½ times as soluble in water as boracic acid. Dry antiseptic is now a regular article of commerce, and can be readily purchased.

A mixture of equal quantities of saltpetre and dry antiseptic having been previously prepared, the sides are first wiped with a portion of the pickle used for pumping and are then laid on

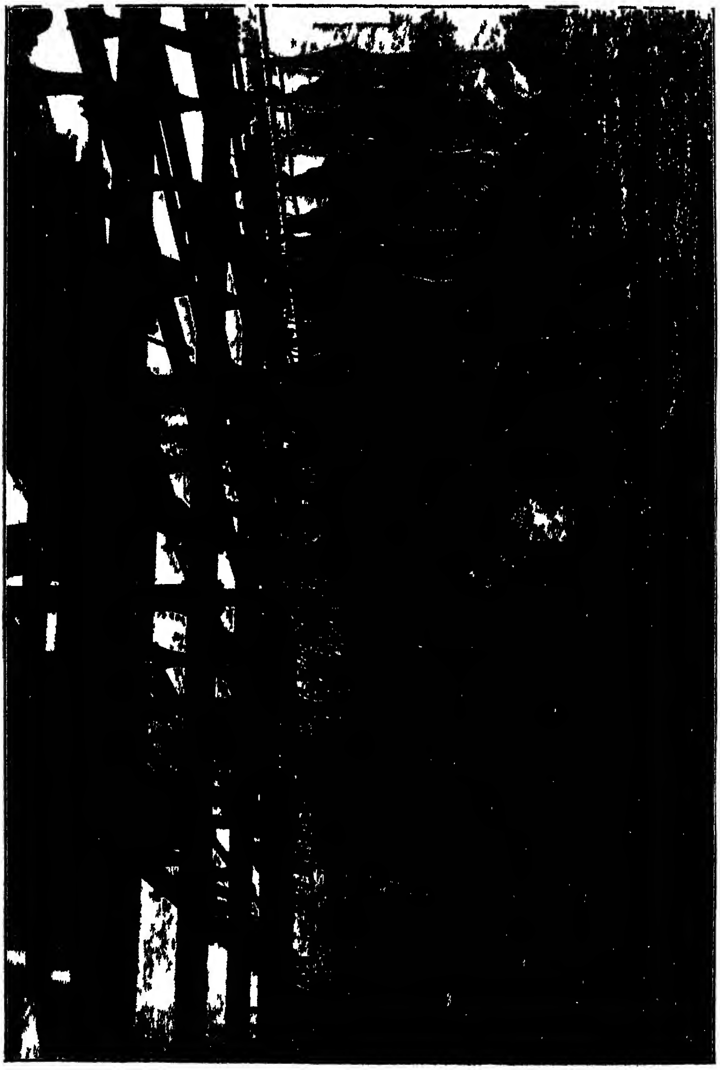

FIG 2.—Hanging house of modern bacon factory where the carcasses are weighed for "dead weight," dismembered, and allowed to cool previous to placing in chilling room

the cellar floor. Some of the mixture of dry antiseptic and saltpetre is next sprinkled over the whole of the inside or cut surfaces. The quantity is usually just sufficient to slightly

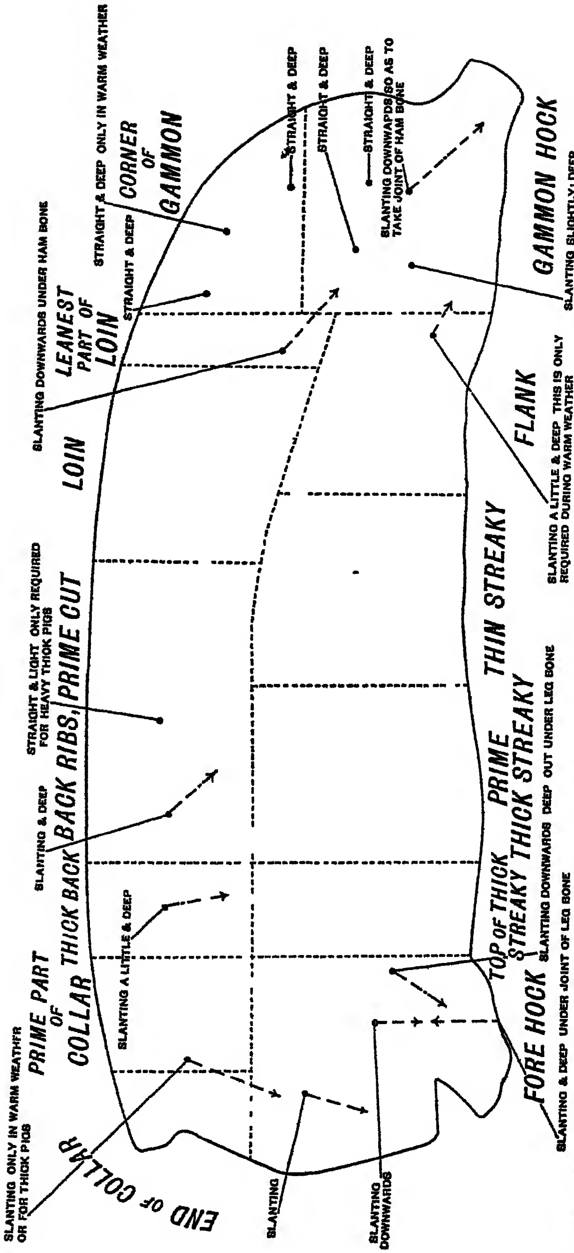

FIG. 3.—Diagram showing places where needle of pickle-pump should be inserted, in pumping a side of bacon; and the direction (shown by the arrows) in which the needle should be thrust.

cover the whole (a sieve being very useful for the purpose of distribution). Salt finely ground is now sprinkled all over the same surface, and the side is permitted to lie in that

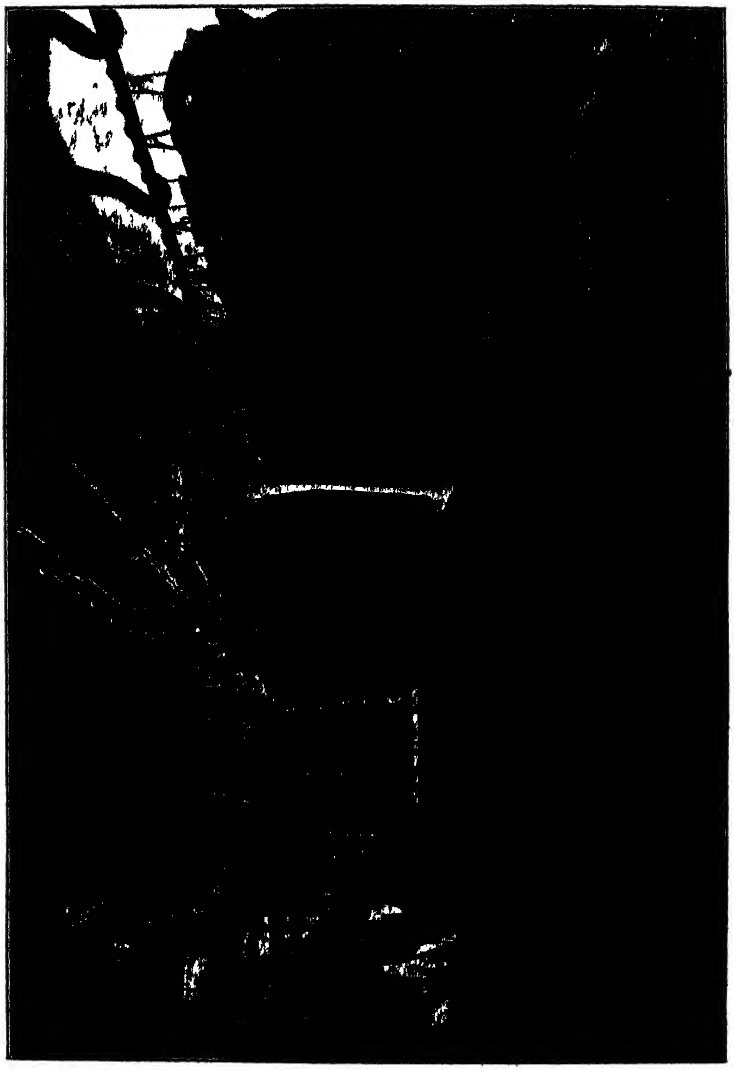

FIG. 4.—Packing or baling loft for "smoked" and "dried" bacon

condition for seven or eight days, when it will be cured, and may then be washed and baled for transport, or the sides may be washed and dried as "pale-dried bacon," or

they may be smoked and sold as smoked bacon Where space in a cellar is of value, the bacon is "stacked" or "piled."

FIG 5 —Side of smoked Wiltshire bacon.

The most important part of the foregoing description is that referring to the pumping. The diagram (fig. 3) is designed to show the various portions into which the side will ultimately be divided, and, at the same time, to indicate the precise place and direction in which the needle of the pickle-pump should be inserted. This diagram has been constructed with the assistance of those well skilled in the matter, and will doubtless serve a permanent purpose.

The process of producing "Wiltshire" bacon which has just been described applies practically to all other kinds. The names of different cuts are very many, and depend on the local habit of cutting portions of a side in a peculiar way. Perhaps the greatest rival of Wiltshire bacon is that produced in Cumberland. But the liking for Cumberland bacon is an acquired taste. It is highly charged with salt as a rule, owing to the primitive methods in use where it is produced. These old-fashioned ways will have to go and give place to the modern methods; or, if not so, it

is safe to say that Cumberland bacon will become a thing of the past.

When the bacon has been cured it is, as a rule, washed free from salt on the surface, and from slime, if any, and allowed to drain. If it should be wanted in the "green" state, it is simply sent out as it is in bales, wrapped in canvas. If wanted in the "pale-dried" state, the sides are hung up in a ventilated drying-room heated to a temperature of 80° F. with steam pipes, and kept there until quite dry. "Smoked bacon" is produced by hanging the sides in a smoke store for about three days, where it is exposed to the smoke and fumes given off by smouldering hard wood sawdust. The ventilation of the smoke stores is a very important matter. When the sides are sufficiently smoked or dried, as the case may be, they are allowed to cool in the packing loft (fig. 4), after which they are weighed and baled for the market.

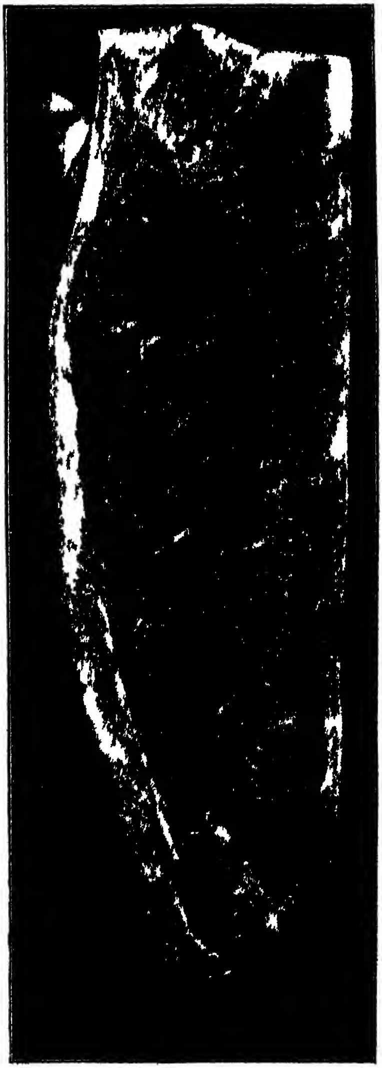

FIG 6.—Side of pale-dried Wiltshire bacon.

Hams.

A somewhat different process is used in the curing of hams, although in principle it is the same. The hams are cut according to the particular description wanted after the sides have been chilled. They are then flung into a pickle tank, filled with pickle made according to the formula already given. They are allowed to remain there until next morning, when they are taken out and pressed so that the

blood may be cleared out of the blood vein. The object of putting them into the pickle is to purge this blood away. They are next laid in beds of salt, care being taken to have the shanks pointing downwards. They may be pumped or not, according to the taste of the curer. The author's experience goes to show that it is wise to pump the blood vein with an antiseptic pickle *at a low pressure.* The same mixture of antiseptic and saltpetre is sprinkled over the cut surfaces, and the whole is covered with salt. At the end of three days the hams are taken up and pressed again so as to remove any blood that may have remained in the blood vein. They are then laid down and covered with fine salt, and are left in this position for about fifteen days. A very good rule applying to hams is that they require a day for every pound weight to cure.

Matured Bacon and Hams

The foregoing description of curing refers exclusively to meats meant for immediate consumption The keeping of meat for a year or so requires a rather different treatment. The time in salt has to be extended for about a week in either case, and the hams or bacon require to be dried.

V.—The Various Forms and Cuts of English Bacon and Hams.

The illustrations which form the essential part of this section are of a most suitable character, inasmuch as they are truthful photographic representations of the best English bacon and hams. I am indebted for the photographs from which these engravings are taken, to Mr. John W. Welsh, of Redruth, who, in addition to being a competent bacon factory manager, is an adept with the camera.

It is only within late years that photographs of the interior of bacon factories have become available, owing to the close character of the business. Such secrecy is altogether a mistake, inasmuch as it only results in fewer factories being built and fewer pigs being produced. It is to the advantage of bacon curers in England that there should be a large supply of pigs, and that farmers should know that their pigs will be purchased when they are grown.

To the best of the author's knowledge, the accompanying illustrations are the first of their kind published, and care has been taken that they should be correct and representative of the qualities of bacon and hams wanted in this country.

The average prices for the various cuts obtainable in England are shown subsequently on a diagram (fig. 15) at p. 101. The author is indebted for these prices to Mr. Bartlett, of Smithfield Market, London.


FIG 7.—Showing how to begin cutting a side of bacon.

The sides of bacon illustrated in figs. 5 and 6 embrace all the qualities of first-class produce. They are of good length, and show evidence of prime feeding. They are lean, and the fore ends are light and small. The middle—the most valuable part—is long and wide, with good streaky meat. The gammon is in proportion. It will be observed that the back outline is very straight from collar to gammon, and the fat of the back is of even thickness over the whole length. The sides carry a large proportion of lean down the back.

In commencing to cut a side of bacon begin by cutting off the "fore-end," as shown in fig. 7. Cut between the third and fourth rib, and as straight as possible. The "pocket hole" should be left entirely on the fore-end, as indicated in fig. 8. As the pocket hole is very liable to putrefy, the fore-ends should be disposed of at once. The fore-end can be cut into three or four different parts, three principal cuts being, as shown in fig. 9 :—

1. Prime part of collar 2. End of collar 3. Fore hock

When cut as shown in the illustration, each piece will present a

a nice clean face to cut, owing to the ragged part of the pocket having been avoided.

The "gammon" (fig. 10) should be cut off as shown by the irregular line in fig. 7, the knife being passed at equal distance from socket bone of gammon to end bone of loin. It will in

FIG 8.—Fore end of a side of bacon.

this way retain its shape in cooking. The two principal cuts are, as shown in fig. 11:—

1. Corner of gammon	2. Three-quarter gammon

The cut to produce these is made about one inch from the socket-bone on the hock side of the bone, the saw going easily through the thigh-bone; when cut the bone is seen only in a small ring on the face of each piece. These cuts show a quantity of solid lean nicely veined with fat, and in well-cured meat the appearance is always bright.

The "middle'' (fig. 12) is left after removing the fore-end and gammon, and it contains the most choice and, consequently, the most valuable part of the side. The principal cuts, as shown in fig. 13, are five, viz.:—

FIG. 9.—Fore-end of a side of bacon, showing cuts for prime part of collar, end of collar, and fore-hock.

1. Thick streaky
2. Thin streaky
3. Back and ribs
4. Lein
5. Flank

These cuts are all choice with the exception of the flank, which is an undesirable and unprofitable cut to handle. By the

system of cutting shown, it is, however, reduced to the smallest possible dimensions.

The following prices—which may be read in conjunction with figs. 14 and 15—have been sent to me by Messrs. John Sumner & Son, of Birmingham, and, as they are fairly repre-

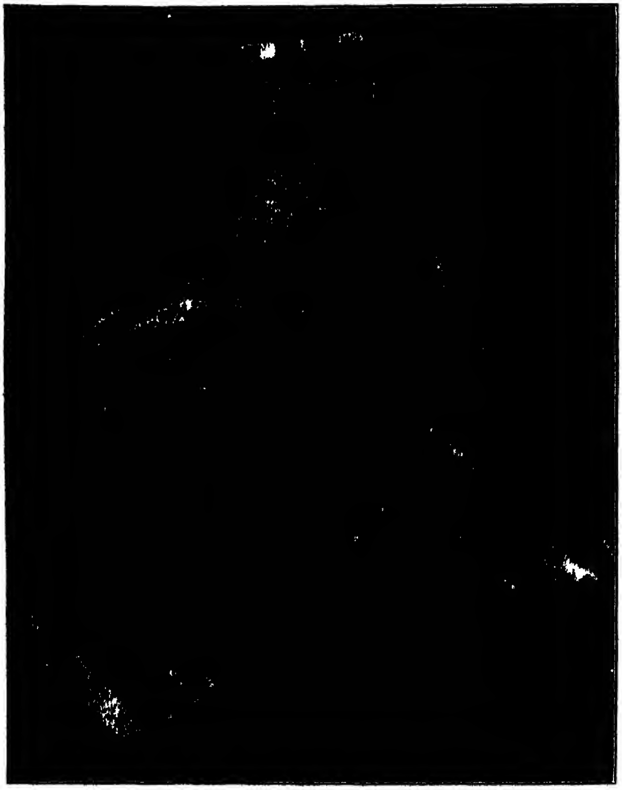

FIG. 10.—Gammon of a side of bacon.

sentative of a good class trade, they are given here. These prices are taken from figures actually realised:—

		d	£	s.	d.
12 lb. gammon	at	9	0	9	0
3 ,, flank	,,	6	0	1	6
14 ,, shoulder and neck		6½	0	7	7
12 ,, streaky	,,	10	0	10	0
16 ,, back	,,	10	0	13	4
			2	1	5
Deduct 57 lb. side at cost of 59*s.* per cwt.			1	10	0
		Profit	0	11	5

Hams (fig. 16 and 17) are being produced in greater quantity in England now than for many years past. Pale dried (fig. 17) are equally in request with smoked (fig. 16). The disadvantage, however, to be contended with in making them lies in the difficulty of getting rid of the middles and fore-ends

FIG. 11.—Gammon of a side of bacon, showing two principal cuts, viz. corner of gammon and three quarter gammon

—the remaining parts of the sides. In Ireland, an enormous trade is carried on in exporting hams to France, and very high prices are realised there for them. The hams illustrated are distinctly English in character, but differ in cut from local kinds such as those of Cumberland. The latter are large and very heavy, and are usually kept for about a year to "mature." The

English ham is meant for immediate consumption, and hence is cured very mild.

FIG. 12.—Middle of a side of bacon

SUMMARY AND CONCLUSION.

We have considered the vast supplies of hogs available on the American continent, and have seen that the Canadians are

fast emulating the United States. In Europe the various hog-producing countries show us an example in accommodating

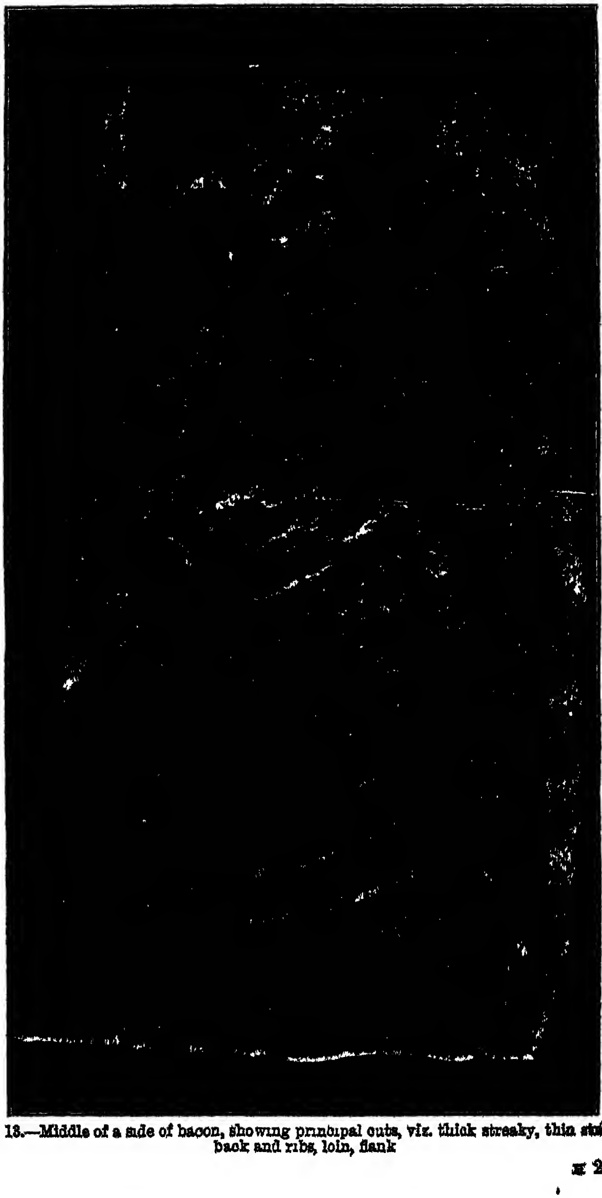

Fig. 13.—Middle of a side of bacon, showing principal cuts, viz. thick streaky, thin streaky, back and ribs, loin, flank

themselves to the altered conditions of agriculture. Are we noting the lesson these countries are reading to us, or not? The reply must be decidedly—no. For, in the face of the supplies we require, and the decrease in supplies of hogs abroad,

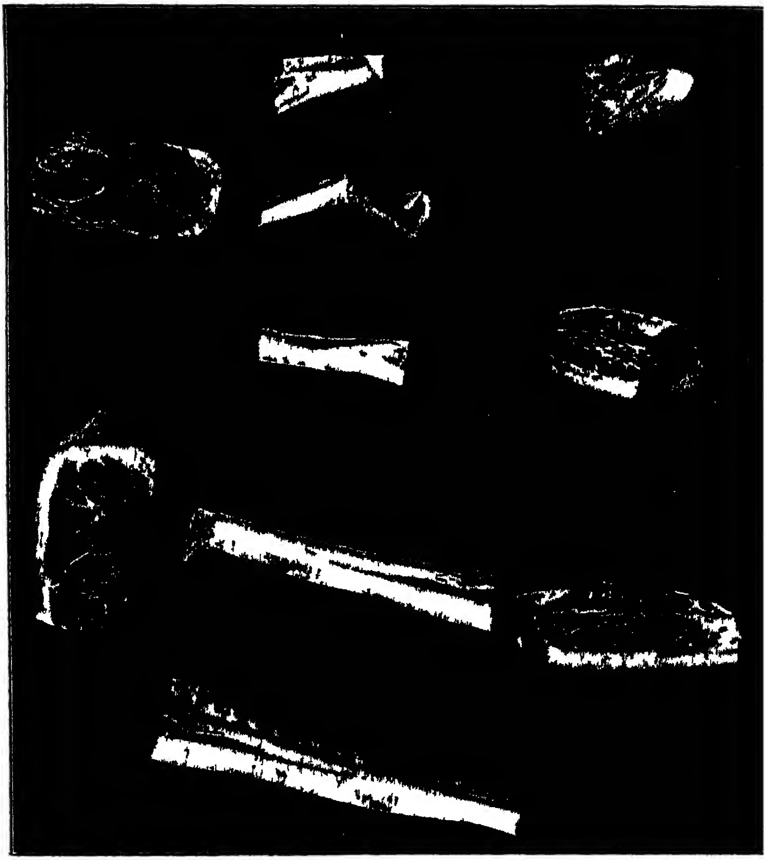

FIG 14.—All the principal cuts from a side of bacon.

1 Corner of gammon
2 Three quarter gammon
3 Flank
4 Thin streaky
5. Long loin
6 Thick streaky
7 Back and rib
8 End of collar
9 Prime part of collar
10 Fore hock

we ourselves register a decrease of over half a million hogs in Great Britain alone. The bringing together of those who would lend their energies to the formation of bacon-curing companies is, as has been illustrated, no very difficult under-

taking. It only requires the agricultural societies to become awakened to the importance of the matter so far as they are

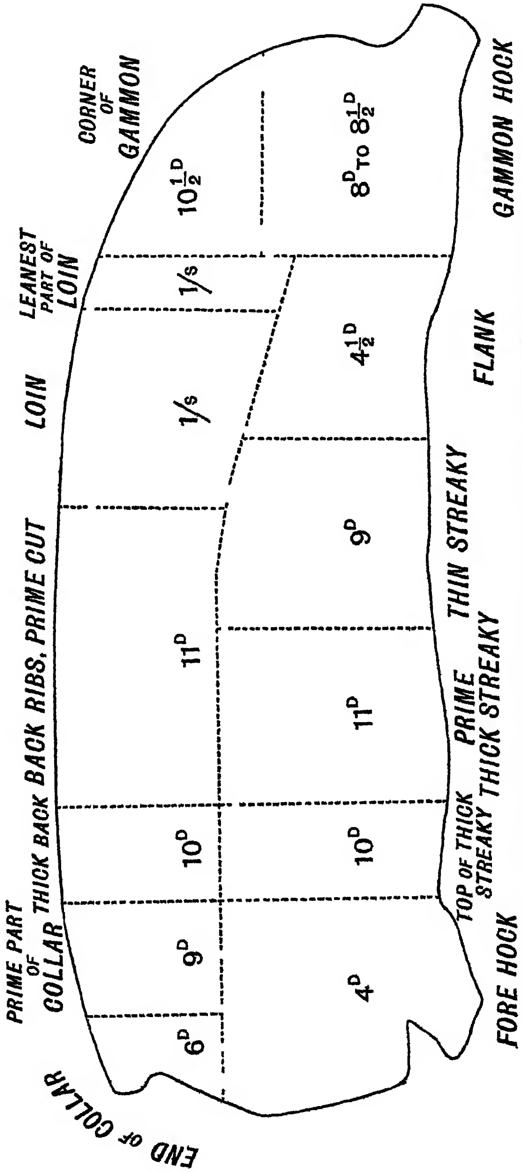

FIG 15.—Diagram showing various cuts of a side of bacon, and the average prices realized for each during 1897.

individually concerned. British agriculturists are surely not deficient in the faculty of combination The localities in which factories are at present situated have been put on record, and those where it is suggested that others might with advantage be placed are also noticed. The equipment of a modern factory is an affair involving some technical knowledge. That, however, is readily enough obtainable The processes are no longer secret, but a knowledge of them can easily be acquired. In spite of all

FIG 16—Smoked English ham

competition we yet command the highest price for English cured meats, which is a fact worth remembering. There is something in the English method of feeding and curing which is worth so many shillings per cwt on the bacon produced at home. The finer finish of the cuts of English meats, as illustrated in this article, cannot be attained with imported meats; the prices cannot be realised. The English curer gets better prices. The meat commands a sale at higher prices. and the retailer gets a handsome profit by the business.

The conclusion is obvious enough,—there is plenty of room for bacon production in England, and it will be a fortunate day

FIG 17.—Pale dried English ham.

for agriculture when all who are interested in the land are brought to see that this is so.

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THE VALUATION OF THE MANURES OBTAINED BY THE CONSUMPTION OF FOODS FOR THE PRODUCTION OF MILK.

AFTER the publication in 1885 of our paper in this Journal on "*The Valuation of Unexhausted Manures,*" in which we limited our illustrations to cases of the manures obtained by the consumption of foods for the production of fattening increase, we

were asked if we could not supply a scale applicable to the consumption of foods for the production of milk. Again, since the publication of our revised valuations in the last issue of the Journal,[1] we have been asked the same question. In answer, we in each case pointed out how such an estimate could approximately be arrived at. There are, however, considerable difficulties in extending the valuations to meet the requirement in the case of milk-production, as will be fully appreciated as we proceed. After careful consideration of the subject we have, however, arranged tables of valuation of the manure obtained when food is consumed for the production of milk, substantially on the plan of those previously given in the case of the production of fattening increase.

In illustration of the complexity and difficulty of the subject, it will be of interest to recall attention here to illustrations we have previously given, of the great difference in the demands made upon the food, on the one hand for the production of animal increase, and on the other for the production of milk. As is well known, not only do cows of different breeds yield widely different quantities of milk, and in some cases milk of characteristically different composition, but individual animals of the same breed have very different milk-yielding capacity; and whatever the average capacity of a cow may be, she has a maximum yield at one period of her lactation, which is followed by a gradual decline. Hence, in comparing the amounts of constituents stored up in the fattening increase of an ox with the amounts of the same constituents removed in the milk of a cow, we must assume a wide range of difference in the yield of milk.

Table I. (p. 105) shows the amounts—of nitrogenous substance, of fat, of non-nitrogenous substance not fat, of total mineral matter, of phosphoric acid, of potash, and of total solid matter, carried off in the weekly yield of milk of a cow, on the alternative assumptions of a produce of 4, 6, 8, 10, 12, 14, 16, 18, or 20 quarts, per head per day; and, for comparison, there are given at the bottom of the Table the amounts—of nitrogenous substance, of fat, of total mineral matter, of phosphoric acid, of potash, and of total solid matter, in the weekly increase in live-weight of a fattening ox, of an average weight of 1,000 lb.—first on the assumption of a weekly increase of 10 lb., and secondly of 15 lb.

The estimates of the amounts of constituents in the milk are based on the assumption that it will contain 12·5 per cent. of total solids, consisting of 3·65 albuminoids, 3·50 butter-fat, 4·60 sugar, and 0·75 total mineral matter; the last containing

[1] Journal R.A.S.E., 3rd series, vol. viii. 1897, part iv. p 674.

0·22 (0·2175) phosphoric acid, and 0·19 (0·1875) potash. The estimates of the constituents in the fattening increase of oxen are founded on determinations made at Rothamsted. On this point it may be added, that the amounts of nitrogenous substance in the animal increase are slightly raised from the original estimate, first published in 1885, and they now accord with that adopted in our valuation tables published in 1885, and again in 1897. The amount of total mineral matter in the increase is also somewhat raised from the original estimate; partly from the consideration that, with earlier maturity, the so-called fattening increase will contain more of growth, and hence somewhat more of both nitrogen and mineral matter, than was assumed in our earlier adopted average estimates.

TABLE I.—*Comparison of the Constituents of Food carried off in Milk, and in the Fattening Increase of Oxen.*

[1 Gallon = 10·33 lb.]	Nitrogenous substance	Fat	Non-nitrogenous substance not fat (sugar)	Total mineral matter (ash)	Phosphoric acid	Potash	Total solid matter
IN MILK PER WEEK.							
If—	lb.	lb.	lb.	lb.	lb.	lb.	lb.
4 quarts per head per day	2·64	2·53	3·33	0·54	0·1566	0·1350	9·04
6 „ „	3·96	3·80	4·99	0·81	0·2349	0·2025	13·56
8 „ „	5·28	5·06	6·66	1·08	0·3132	0·2700	18·08
10 „ „	6·60	6·33	8·32	1·35	0·3915	0·3375	22·60
12 „ „	7·92	7·59	9·99	1·62	0·4698	0·4050	27·12
14 „ „	9·24	8·86	11·65	1·89	0·5481	0·4725	31·64
16 „ „	10·56	10·12	13·32	2·16	0·6264	0·5400	36·16
18 „ „	11·88	11·39	14·98	2·43	0·7047	0·6075	40·68
20 „ „	13·20	12·65	16·65	2·70	0·7830	0·6750	45·20
IN INCREASE IN LIVE-WEIGHT PER WEEK (OXEN).							
If 10 lb. increase	0·80	6·35	—	0·20	0·086	0·011	7·35
If 15 lb. increase	1·20	9·53	—	0·30	0·129	0·0165	11·03

Referring to the very wide range of yield of milk per head per day which the figures in the Table assume, it may be remarked that it is by no means impossible that the same animal might yield the largest amount—namely, 20 quarts, or 5 gallons, per day, near the beginning, and only 4 quarts, or 1 gallon, or even less, towards the end of her period of lactation. At the same time, a moderately large herd of, say Shorthorns or Ayrshires, of fairly average quality, well fed, and including animals of various periods of lactation, should not yield an average of less than 8 quarts, or 2 gallons, and would seldom exceed 10 quarts, or 2½ gallons, per head per day, the year round.

For the purposes of illustration, we will assume an average yield of milk of 10 quarts, equal 2½ gallons, or between 25 and 26 lb. per head per day; and compare the amount of constituents in the weekly yield at this rate, with that in the weekly increase of the fattening ox at the higher rate assumed in the Table—namely, 15 lb. per 1,000 lb. live-weight, or 1·5 per cent., per week.

Thus, of the nitrogenous substance of the food, the amount stored up in the fattening increase of the ox will be only 1·2 lb., but the amount carried off as such in the milk would be 6·6 lb., or 5½ times as much as in the increase. Of mineral matter, again, the fattening increase would not contain more than 0·3 lb.; whilst the milk would carry off 1·35 lb. or 4½ times as much; of phosphoric acid, the increase would contain 0·129 lb. and the milk 0·3915 lb. or more than 3 times as much; and of potash, the fattening increase would contain 0 0165 lb., but the milk 0·3375 lb., or more than 20 times as much.

Although the fact has no bearing on our present estimates, it is of interest to observe that, whilst the fattening increase would contain 9·53 lb. of fat, the milk would contain only 6·33 lb., or only about two-thirds as much. On the other hand, whilst the fattening increase contains practically no other non-nitrogenous substance besides fat, the milk would carry off 8·32 lb. in the form of milk-sugar. It may be added, that this amount of milk-sugar reckoned as fat would correspond approximately to the difference between the fat in the milk and that in the fattening increase.

From the foregoing comparisons, it is evident that the drain upon the food is very much greater for the production of milk than for that of meat; leaving, therefore, correspondingly smaller amounts of the constituents consumed remaining for manure. This is especially the case in the important item of nitrogenous substance; and if, as is frequently assumed, the butter-fat of the milk is, at any rate to a great extent, primarily derived from the nitrogenous substance of the food, so far as it is so, about two parts of such substance would be required to produce one of fat. On such an assumption, therefore, the requirement for nitrogenous substance of food would be much greater than that indicated in the Table (I.) as existing as nitrogenous substance in the milk. But the nitrogen of any amount of nitrogenous substance so utilised for the production of fat would nevertheless be recovered in the manure.

Independently, however, of the difficulty of estimating the average value of the manure derived from the consumption of food for the production of milk, arising from the very wide difference in the amount of milk yielded by different cows, or

by the same cow at different periods of her lactation, our knowledge as to the difference in the amount of the food actually consumed by the animal coincidently with the production of such different amounts of milk, is far from definite and trustworthy. The difference in the amounts of consumption in relation to production will, however, be much less, and will less materially vitiate estimates of manure-value in the case of herds; especially if the individuals are selected with ordinary judgment as to milk-yielding capacity, and period of lactation, and if the feeding is also managed with judgment, under the guidance of experience.

Although information is wanting to enable us to connect, with numerical accuracy, the great differences in milk-yield of individual cows with the coincident differences in consumption to produce it, it may be considered as satisfactorily established, by the results of ourselves and others in this country, that more food is consumed by a herd of cows to produce a fair yield of milk, of say 8 or 10 quarts per head per day, than by an equal live-weight of oxen fed to produce fattening increase.[1] In the cases supposed, it may, for practical purposes, be assumed that the cows would consume about one-fourth more food than the oxen. Accordingly, in our estimates of the value of the manure obtained on the consumption of food for the production of milk, we have assumed that one-fourth more will be consumed by 1,000 lb. live-weight of cows than by the same weight of oxen; but the estimates of the amounts of the constituents of the food removed in the milk, or remaining for manure, are nevertheless reckoned per ton of each food consumed, as in the case of those relating to feeding for the production of fattening increase. It may be added, that the calculations of the amounts of the constituents in the milk are based on the same average composition of milk as is adopted in the construction of Table I. (p. 105), and described in detail in the letterpress at pp. 104–5. Thus, the nitrogen is taken at 0·579 (=3·65 nitrogenous substance) per cent., the phosphoric acid at 0·2175 per cent., and the potash at 0·1875 per cent., in the milk.

Table II. (pp. 108, 109) shows in detail the estimate of the amount of nitrogen in one ton of each food, and in the milk produced from its consumption, on the assumption of an average yield of 10 quarts per head per day; also the amount remaining for manure the amount of ammonia corresponding to the

[*continued on p.* 111

[1] In making the above statement, we are fully aware that in Wolff's *Tables of Standard Rations*, he assumes that milch cows will consume less total dry matter of food, and also less of digestible nitrogenous substance, non-nitrogenous substance, and total organic substance, for a given live-weight per day than fattening oxen. This is, however, certainly not the case with fairly well-bred and liberally fed cows in this country, giving good yields of milk.

Table II.—*Estimates of the Total or Original Manure-value of Milk. Valuations on the assumption of an average pro-*

Nos.	Description of food	Nitrogen: In 1 ton of food	Nitrogen: In milk from 1 ton of food	Nitrogen: In manure: Total remaining for manure	Nitrogen: In manure: Nitrogen equal ammonia	Value of ammonia at 4*d.* per lb.
		lb.	lb.	lb.	lb.	£ s. d.
1	Linseed	80·64	25·04	55·60	67·52	1 2 6
2	Linseed cake	106·40	20·86	85·54	103·87	1 14 7
3	Decorticated cotton cake	147·84	19·27	128·57	156·13	2 12 1
4	Palm-nut cake	56·00	17·86	38·14	46·31	0 15 5
5	Undecorticated cotton cake	84·00	15·66	68·34	82·99	1 7 8
6	Cocoa-nut cake	76·16	15·66	60·50	73·47	1 4 6
7	Rape cake	109·76	12·50	97·26	118·11	1 19 4
8	Peas	80·64	17·86	62·78	76·24	1 5 5
9	Beans	89·60	17·86	71·74	87·12	1 9 0
10	Lentils	94·08	17·86	76·22	92·56	1 10 10
11	Tares (seed)	94·08	17·86	76·22	92·56	1 10 10
12	Indian corn	38·08	17·38	20·70	25·14	0 8 5
13	Wheat	40·32	17·38	22·94	27·86	0 9 3
14	Malt	38·08	17·86	20·22	24·55	0 8 2
15	Barley	36·96	17·38	19·58	23·78	0 7 11
16	Oats	44·80	16·68	28·12	34·15	0 11 5
17	Rice meal	42·56	16·68	25·88	31·43	0 10 6
18	Locust beans	26·88	13·90	12·98	15·76	0 5 3
19	Malt coombs	87·36	15·66	71·70	87·07	1 9 0
20	Fine pollard	54·88	16·68	38·20	46·39	0 15 6
21	Coarse pollard	56·00	15·66	40·34	48·99	0 16 4
22	Bran	56·00	13·90	42·10	51·12	0 17 0
23	Clover hay	53·76	8·94	44·82	54·43	0 18 2
24	Meadow hay	33·60	8·36	25·24	30·65	0 10 3
25	Pea straw	22·40	7·83	14·57	17·69	0 5 11
26	Oat straw	11·20	6·95	4·25	5·16	0 1 9
27	Wheat straw	10·08	5·98	4·10	4·98	0 1 8
28	Barley straw	8·96	5·46	3·50	4·25	0 1 5
29	Bean straw	20·16	5·68	14·48	17·58	0 5 10
30	Potatoes	5·60	2·07	3·53	4·29	0 1 5
31	Carrots	4·48	1·46	3·02	3·67	0 1 3
32	Parsnips	4·93	1·67	3·26	3·96	0 1 4
33	Mangel wurzels	4·93	1·32	3·61	4·38	0 1 6
34	Swedish turnips	5·60	1·14	4·46	5·42	0 1 10
35	Yellow turnips	4·48	0·93	3·55	4·31	0 1 5
36	White turnips	4·03	0·84	3·19	3·87	0 1 3

Cattle Foods after Consumption by Cows for the Production of duction by a herd, of 10 quarts of milk per head per day.

Phosphoric Acid					Potash					Total or original manure-value per ton of food consumed		
In 1 ton of food	In milk from 1 ton of food	In manure			In 1 ton of food	In milk from 1 ton of food	In manure					
		Total remaining for manure	Value at 2d. per lb.				Total remaining for manure	Value at 1½d. per lb.				
lb.	lb.	lb.	s.	d.	lb.	lb.	lb.	s.	d.	£	s.	d.
34·50	9·34	25·16	4	2	30·69	8·02	22·67	2	10	1	9	6
44·80	7·79	37·01	6	2	31·36	6·71	24·65	3	1	2	3	10
69·44	7·18	62·26	10	5	44·80	6·22	38·58	4	10	3	7	4
26·88	6·68	20·20	3	4	11·20	5·73	5·47	0	8	0	19	5
44·80	5·85	38·95	6	6	44·80	5·07	39·73	5	0	1	19	2
31·36	5·85	25·51	4	3	44·80	5·07	39·73	5	0	1	13	9
56·00	4·69	51·31	8	7	33·60	4·09	29·51	3	8	2	11	7
19·04	6·68	12·36	2	1	21·50	5·73	15·77	2	0	1	9	6
24·64	6·68	17·96	3	0	29·12	5·73	23·39	2	11	1	14	11
16·80	6·68	10·12	1	8	15·68	5·73	9·95	1	3	1	13	9
17·92	6·68	11·24	1	10	17·92	5·73	12·19	1	6	1	14	2
13·44	6·50	6·94	1	2	8·29	5·56	2·73	0	4	0	9	11
19·04	6·50	12·54	2	1	11·87	5·56	6·31	0	9	0	12	1
17·92	6·68	11·24	1	10	11·20	5·73	5·47	0	8	0	10	8
16·80	6·50	10·30	1	9	12·32	5·56	6·76	0	10	0	10	6
13·44	6·24	7·20	1	2	11·20	5·40	5·80	0	9	0	13	4
(13·44)	6·24	7·20	1	2	(8·29)	5·40	2·89	0	4	0	12	0
—	5·19	—	—		—	4·42	—	—			—	
44·80	5·85	38·95	6	6	44·80	5·07	39·73	5	0	2	0	6
64·96	6·24	58·72	9	9	32·70	5·40	27·30	3	5	1	8	8
78·40	5·85	72·55	12	1	33·60	5·07	28·53	3	7	1	12	0
80·64	5·19	75·45	12	7	32·48	4·42	28·06	3	6	1	13	1
12·77	3·35	9·42	1	7	33·60	2·94	30·66	3	10	1	3	7
8·96	3·10	5·86	1	0	35·84	2·62	33·22	4	2	0	15	5
7·84	2·91	4·93	0	10	22·40	2·46	19·94	2	6	0	9	3
5·38	2·60	2·78	0	6	22·40	2·29	20·11	2	6	0	4	9
5·38	2·23	3·15	0	6	17·92	1·96	15·96	2	0	0	4	2
4·03	2·04	1·99	0	4	22·40	1·80	20·60	2	7	0	4	4
6·72	2·14	4·58	0	9	22·40	1·80	20·60	2	7	0	9	2
3·36	0·78	2·58	0	5	12·32	0·66	11·66	1	5	0	3	3
2·02	0·51	1·48	0	3	6·27	0·49	5·78	0	9	0	2	3
4·26	0·63	3·63	0	7	8·06	0·49	7·57	0	11	0	2	10
1·57	0·49	1·08	0	2	8·96	0·49	8·47	1	1	0	2	9
1·34	0·44	0·90	0	2	4·93	0·33	4·60	0	7	0	2	7
(1·34)	0·34	1·00	0	2	(4·93)	0·33	(4·60)	0	7	0	2	2
1·12	0·31	0·81	0	2	6·72	0·33	6·39	0	10	0	2	3

TABLE III.—*Comparison of the Estimates of Total or Original Manure-value when Foods are consumed for the Production of Fattening Increase, with those when the Food is consumed by Cows giving different yields of Milk.*

Nos.	Description of food	Total or original manure-value per ton of food consumed—that is, only deducting the constituents in fattening increase or in milk																	
		For the production of fattening increase			For the production of milk, supposing the yield per head per day to be as under—														
					6 quarts			8 quarts			10 quarts			12 quarts			14 quarts		
		£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
1	Linseed	1	19	2	1	14	7	1	12	0	1	9	6	1	7	1	1	4	5
2	Linseed cake	2	11	11	2	8	1	2	6	0	2	3	10	2	1	9	1	19	8
3	Decorticated cotton cake	3	14	9	3	11	2	3	9	2	3	7	4	3	5	4	3	3	4
4	Palm-nut cake	1	6	4	1	3	2	1	1	4	0	19	5	0	17	9	0	15	11
5	Undecorticated cotton cake	2	5	3	2	2	4	2	0	8	1	19	2	1	17	6	1	15	11
6	Cocoa-nut cake	1	19	10	1	16	11	1	15	3	1	13	9	1	12	3	1	10	6
7	Rape cake	2	16	5	2	14	2	2	12	11	2	11	7	2	10	4	2	9	1
8	Peas	1	16	5	1	13	1	1	11	2	1	9	6	1	7	8	1	5	9
9	Beans	2	1	11	1	18	7	1	16	10	1	14	11	1	13	1	1	11	4
10	Lentils	2	0	8	1	17	5	1	15	7	1	13	9	1	12	2	1	10	1
11	Tares (seed)	2	1	1	1	17	11	1	16	0	1	14	2	1	12	6	1	10	7
12	Indian corn	0	16	7	0	13	4	0	11	7	0	9	11	0	8	1	0	6	5
13	Wheat	0	18	11	0	15	8	0	13	11	0	12	1	0	10	5	0	8	8
14	Malt	0	17	7	0	14	5	0	12	7	0	10	8	0	9	0	0	7	1
15	Barley	0	17	2	0	14	0	0	12	3	0	10	6	0	8	8	0	6	11
16	Oats	0	19	9	0	16	8	0	15	0	0	13	4	0	11	7	0	9	10
17	Rice meal	(0	18	6)	0	15	5	0	13	9	0	12	0	0	10	5	0	8	7
18	Locust beans		—			—			—			—			—			—	
19	Malt coombs	2	6	7	2	3	9	2	2	0	2	0	6	1	18	11	1	17	4
20	Fine pollard	1	15	2	1	12	0	1	10	5	1	8	8	1	6	11	1	5	3
21	Coarse pollard	1	18	1	1	15	2	1	13	6	1	12	0	1	10	5	1	8	9
22	Bran	1	18	6	1	15	11	1	14	6	1	13	1	1	11	8	1	10	3
23	Clover hay	1	7	0	1	5	5	1	4	5	1	3	7	1	2	8	1	1	8
24	Meadow hay	0	18	7	0	17	0	0	16	3	0	15	5	0	14	5	0	13	7
25	Pea straw	0	12	2	0	10	9	0	10	0	0	9	3	0	8	5	0	7	8
26	Oat straw	0	7	5	0	6	2	0	5	5	0	4	9	0	4	0	0	3	3
27	Wheat straw	0	6	6	0	5	5	0	4	10	0	4	2	0	3	6	0	3	0
28	Barley straw	0	6	5	0	5	6	0	4	10	0	4	4	0	3	9	0	3	2
29	Bean straw	0	11	5	0	10	4	0	9	9	0	9	2	0	8	7	0	8	0
30	Potatoes	0	4	1	0	3	9	0	3	6	0	3	3	0	3	1	0	2	11
31	Carrots	0	2	9	0	2	6	0	2	4	0	2	3	0	2	1	0	1	11
32	Parsnips	0	3	6	0	3	3	0	3	1	0	2	10	0	2	8	0	2	7
33	Mangel wurzels	0	3	2	0	3	0	0	2	10	0	2	9	0	2	7	0	2	5
34	Swedish turnips	0	2	11	0	2	9	0	2	8	0	2	7	0	2	5	0	2	3
35	Yellow turnips	(0	2	6)	0	2	4	0	2	3	0	2	2	0	2	1	0	2	0
36	White turnips	0	2	7	0	2	5	0	2	4	0	2	3	0	2	2	0	2	0

nitrogen, and the value of the ammonia at 4*d.* per lb. Similar particulars are also given in relation to the phosphoric acid and the potash, consumed in the food, removed in the milk, and remaining for manure, &c. This table will serve as a sufficient illustration of the mode of estimating the *total or original* value of the manure, derived from the consumption of the different foods for the production of milk in the case supposed; that is assuming an average yield of a herd of 10 quarts per head per day.

We have, however, made similar detailed calculations of the *total or original* manure-value (as in Table II. for 10 quarts), on the alternative assumptions of a yield of 6, 8, 12, and 14 quarts, per head per day; and, so far as the estimates of the *total or original manure-value* are concerned, the results for the various amounts of milk-yield are given in Table III. (p. 110). For comparison there is also given, in the first column, the estimate of the *total or original* manure-value when the foods are consumed for the production of fattening increase.

So much for the plan and results of the estimations of the *total or original* manure-value of the different foods, that is deducting only the constituents removed in the milk, and reckoning the remainder at the prices at which they can be purchased in artificial manures. With a view to direct application to practice, however, we have now to endeavour to estimate the *unexhausted manure-value* of the different foods, or what may be called their *compensation-value,* after they have been used for a series of years by the outgoing tenant, and he has realised a certain portion of the manure-value in his increased crops. In the calculations we have adopted the same scale of reduction of the manure-value from year to year as in the case of the manure derived from the consumption of the foods for the production of fattening increase; and we must refer to the Section—"*Unexhausted Manure-value of Cattle Foods*"—in our paper in the last number of the Journal, for further comments and arguments on the subject. It will suffice to state here, that the rule is to deduct one-half of the *original manure-value* of the food used the last year, and one-third of the remainder each year to the eighth, in the case of all the more concentrated foods, and the roots; in fact of all the foods in the list excepting the hays and the straws; and for these, which contain larger amounts of indigestible matter, and the constituents of which will be more slowly available to crops, two-thirds of the *original manure-value* is deducted for the last year, and only one-fifth from year to year to the eighth year back.

The results of the estimates of *compensation-value* so made, are given for the five yields of 6, 8, 10, 12, and 14 quarts of milk

[*continued on p.* 117

TABLE IV.—*Estimates of the Compensation-value of the Unexhausted Manures when Foods are consumed for the Production of Milk, starting from the Total or Original Manure-value.*

1. Assuming a yield of 6 quarts of milk per head per day.

Foods	Total or original manure-value, deducting constituents in milk only	Compensation-value of unexhausted manures: Last year	Second year	Third year	Fourth year	Fifth year	Sixth year	S'v'nth year	Eighth year	Total
DEDUCT $\frac{1}{2}$ OF ORIGINAL MANURE-VALUE THE LAST YEAR, AND $\frac{1}{3}$ FROM YEAR TO YEAR										
One Ton	£ s. d.	£ s. d.	£ s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	£ s. d.
1. Linseed	1 14 7	0 17 4	0 11 7	7 9	5 2	3 5	2 3	1 6	1 0	2 10 0
2. Linseed cake	2 8 1	1 4 1	0 16 1	10 9	7 2	4 9	3 2	2 1	1 5	3 9 6
3. Decorticated cotton cake	3 11 2	1 15 7	1 3 9	15 10	10 7	7 1	4 9	3 2	2 1	5 2 10
4. Palm-nut cake	1 3 2	0 11 7	0 7 9	5 2	3 5	2 3	1 6	1 0	0 8	1 13 4
5. Undecorticat'd cotton cake	2 2 4	1 1 2	0 14 1	9 5	6 3	4 2	2 9	1 10	1 3	3 0 11
6. Cocoa-nut cake	1 16 11	0 18 6	0 12 4	8 3	5 6	3 8	2 5	1 7	1 1	2 13 4
7. Rape cake	2 14 2	1 7 1	0 18 1	12 1	8 1	5 5	3 7	2 5	1 7	3 18 4
8. Peas	1 13 1	0 16 7	0 11 1	7 5	4 11	3 3	2 2	1 5	0 11	2 7 9
9. Beans	1 18 7	0 19 4	0 12 11	8 7	5 9	3 10	2 7	1 9	1 2	2 15 11
10. Lentils	1 17 5	0 18 9	0 12 6	8 4	5 7	3 9	2 6	1 8	1 1	2 14 2
11. Tares (seed)	1 17 11	0 19 0	0 12 8	8 5	5 7	3 9	2 6	1 8	1 1	2 14 8
12. Indian corn	0 13 4	0 6 8	0 4 5	2 11	1 11	1 3	0 10	0 7	0 5	0 19 0
13. Wheat	0 15 8	0 7 10	0 5 3	3 6	2 4	1 7	1 1	0 9	0 6	1 2 10
14 Malt	0 14 5	0 7 3	0 4 10	3 3	2 2	1 5	0 11	0 7	0 5	1 0 10
15. Barley	0 14 0	0 7 0	0 4 8	3 1	2 1	1 5	0 11	0 7	0 5	1 0 2
16. Oats	0 16 8	0 8 4	0 5 7	3 9	2 6	1 8	1 1	0 9	0 6	1 4 2
17. Rice meal	0 15 5	0 7 9	0 5 2	3 5	2 3	1 6	1 0	0 8	0 5	1 2 2
18. Locust beans	—	—	—	—	—	—	—	—	—	—
19. Malt coombs	2 3 9	1 1 11	0 14 7	9 9	6 6	4 4	2 11	1 11	1 3	3 3 2
20. Fine pollard	1 12 0	0 16 0	0 10 8	7 1	4 9	3 2	2 1	1 5	0 11	2 6 1
21. Coarse pollard	1 15 2	0 17 7	0 11 9	7 10	5 3	3 6	2 4	1 7	1 1	2 10 11
22. Bran	1 15 11	0 18 0	0 12 0	8 0	5 4	3 7	2 5	1 7	1 1	2 12 0
DEDUCT $\frac{2}{3}$ OF ORIGINAL MANURE-VALUE THE LAST YEAR, AND $\frac{1}{5}$ FROM YEAR TO YEAR										
One Ton										
23. Clover hay	1 5 5	0 8 6	0 6 10	5 6	4 5	3 6	2 10	2 3	1 10	1 15 8
24. Meadow hay	0 17 0	0 5 8	0 4 6	3 7	2 10	2 3	1 10	1 6	1 2	1 3 4
25. Pea straw	0 10 9	0 3 7	0 2 10	2 3	1 10	1 6	1 2	0 11	0 9	0 14 10
26. Oat straw	0 6 2	0 2 1	0 1 8	1 4	1 1	0 10	0 8	0 6	0 5	0 8 7
27. Wheat straw	0 5 5	0 1 10	0 1 6	1 2	0 11	0 9	0 7	0 6	0 5	0 7 8
28. Barley straw	0 5 6	0 1 10	0 1 6	1 2	0 11	0 9	0 7	0 6	0 5	0 7 8
29. Bean straw	0 10 4	0 3 5	0 2 9	2 2	1 9	1 5	1 2	0 11	0 9	0 14 4
DEDUCT $\frac{1}{2}$ OF ORIGINAL MANURE-VALUE THE LAST YEAR, AND $\frac{1}{3}$ FROM YEAR TO YEAR										
Ten Tons										
30. Potatoes	1 17 6	0 18 9	0 12 6	8 4	5 7	3 9	2 6	1 8	1 1	2 14 2
31. Carrots	1 5 0	0 12 6	0 8 4	5 7	3 9	2 6	1 8	1 1	0 9	1 16 2
32. Parsnips	1 12 6	0 16 3	0 10 10	7 3	4 10	3 3	2 2	1 5	0 11	2 6 11
33. Mangel wurzels	1 10 0	0 15 0	0 10 0	6 8	4 5	2 11	1 11	1 3	0 10	2 3 0
34. Swedish turnips	1 7 6	0 13 9	0 9 2	6 1	4 1	2 9	1 10	1 3	0 10	1 19 9
35. Yellow turnips	1 3 4	0 11 8	0 7 9	5 2	3 5	2 3	1 6	1 0	0 8	1 13 5
36. White turnips	1 4 2	0 12 1	0 8 1	5 5	3 7	2 5	1 7	1 1	0 9	1 15 0

TABLE V.—*Estimates of the Compensation-value of the Unexhausted Manures when Foods are consumed for the Production of Milk, starting from the Total or Original Manure-value.*

2. Assuming a yield of 8 quarts of milk per head per day.

Foods	Total or original manure-value, deducting constituents in milk only	Compensation value of unexhausted manures: Last year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh year	Eighth year	Total
DEDUCT $\frac{1}{2}$ OF ORIGINAL MANURE-VALUE THE LAST YEAR, AND $\frac{1}{3}$ FROM YEAR TO YEAR										
One Ton	£ s. d.	£ s. d.	£ s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	£ s. d.
1. Linseed	1 12 0	0 16 0	0 10 8	7 1	4 9	3 2	2 1	1 5	0 11	2 6 1
2. Linseed cake	2 6 0	1 3 0	0 15 4	10 3	6 10	4 7	3 1	2 1	1 5	3 6 7
3. Decorticated cotton cake	3 9 2	1 14 7	1 3 1	15 5	10 3	6 10	4 7	3 1	2 1	4 19 11
4. Palm-nut cake	1 1 4	0 10 8	0 7 1	4 9	3 2	2 1	1 5	0 11	0 7	1 10 8
5. Undecortic't'd cotton cake	2 0 8	1 0 4	0 13 7	9 1	6 1	4 1	2 9	1 10	1 3	2 19 0
6. Cocoa-nut cake	1 15 3	0 17 8	0 11 9	7 10	5 3	3 6	2 4	1 7	1 1	2 11 0
7. Rape cake	2 12 11	1 6 6	0 17 8	11 9	7 10	5 3	3 6	2 4	1 7	3 16 5
8. Peas	1 11 2	0 15 7	0 10 5	6 11	4 7	3 1	2 1	1 5	0 11	2 5 0
9. Beans	1 16 10	0 18 5	0 12 3	8 2	5 5	3 7	2 5	1 7	1 1	2 12 11
10. Lentils	1 15 7	0 17 10	0 11 11	7 11	5 3	3 6	2 4	1 7	1 1	2 11 5
11. Tares (seed)	1 16 0	0 18 0	0 12 0	8 0	5 4	3 7	2 5	1 7	1 1	2 12 0
12. Indian corn	0 11 7	0 5 10	0 3 11	2 7	1 9	1 2	0 9	0 6	0 4	0 16 10
13. Wheat	0 13 11	0 7 0	0 4 8	3 1	2 1	1 5	0 11	0 7	0 5	1 0 2
14. Malt	0 12 7	0 6 4	0 4 3	2 10	1 11	1 3	0 10	0 7	0 5	0 18 5
15. Barley	0 12 3	0 6 2	0 4 1	2 9	1 10	1 3	0 10	0 7	0 5	0 17 11
16. Oats	0 15 0	0 7 6	0 5 0	3 4	2 3	1 6	1 0	0 8	0 5	1 1 8
17. Rice meal	0 13 9	0 6 11	0 4 7	3 1	2 1	1 5	0 11	0 7	0 5	1 0 0
18. Locust beans	—	—	—	—	—	—	—	—	—	—
19. Malt coombs	2 2 0	1 1 0	0 14 0	9 4	6 3	4 2	2 9	1 10	1 3	3 0 7
20. Fine pollard	1 10 5	0 15 3	0 10 2	6 9	4 6	3 0	2 0	1 4	0 11	2 3 11
21. Coarse pollard	1 13 6	0 16 9	0 11 2	7 5	4 11	3 3	2 2	1 5	0 11	2 8 0
22. Bran	1 14 6	0 17 3	0 11 6	7 8	5 1	3 5	2 3	1 6	1 0	2 9 8
DEDUCT $\frac{1}{3}$ OF ORIGINAL MANURE-VALUE THE LAST YEAR, AND $\frac{1}{4}$ FROM YEAR TO YEAR										
One Ton										
23. Clover hay	1 4 5	0 8 2	0 6 6	5 2	4 2	3 4	2 8	2 2	1 9	1 13 11
24. Meadow hay	0 16 3	0 5 5	0 4 4	3 6	2 10	2 3	1 10	1 6	1 2	1 2 10
25. Pea straw	0 10 0	0 3 4	0 2 8	2 2	1 9	1 5	1 2	0 11	0 9	0 14 2
26. Oat straw	0 5 5	0 1 10	0 1 6	1 2	0 11	0 9	0 7	0 6	0 5	0 7 8
27. Wheat straw	0 4 10	0 1 7	0 1 3	1 0	0 10	0 8	0 6	0 5	0 4	0 6 7
28. Barley straw	0 4 10	0 1 7	0 1 3	1 0	0 10	0 8	0 6	0 5	0 4	0 6 7
29. Bean straw	0 9 9	0 3 3	0 2 7	2 1	1 8	1 4	1 1	0 10	0 8	0 13 6
DEDUCT $\frac{1}{2}$ OF ORIGINAL MANURE-VALUE THE LAST YEAR, AND $\frac{1}{3}$ FROM YEAR TO YEAR										
Ten Tons										
30. Potatoes	1 15 0	0 17 6	0 11 8	7 9	5 2	3 5	2 3	1 6	1 0	2 10 3
31. Carrots	1 3 4	0 11 8	0 7 9	5 2	3 5	2 3	1 6	1 0	0 8	1 13 5
32. Parsnips	1 10 10	0 15 5	0 10 3	6 10	4 7	3 1	2 1	1 5	0 11	2 4 7
33. Mangel wurzels	1 8 4	0 14 2	0 9 5	6 3	4 2	2 9	1 10	1 3	0 10	2 0 8
34. Swedish turnips	1 6 8	0 13 4	0 8 11	5 11	3 11	2 7	1 9	1 2	0 9	1 18 4
35. Yellow turnips	1 2 6	0 11 3	0 7 6	5 0	3 4	2 3	1 6	1 0	0 8	1 12 6
36. White turnips	1 3 4	0 11 8	0 7 9	5 2	3 5	2 3	1 6	1 0	0 8	1 13 5

TABLE VI.—*Estimates of the Compensation-value of the Unexhausted Manures when Foods are consumed for the Production of Milk, starting from the Total or Original Manure-value.*

3. Assuming a yield of 10 quarts of milk per head per day.

Foods	Total or original manure-value, deducting constituents in milk only	Compensation-value of unexhausted manures: Last year	Second year	Third year	Fourth year	Fifth year	Sixth year	S'v'nth year	Eighth year	Total
DEDUCT ½ OF ORIGINAL MANURE-VALUE THE LAST YEAR, AND ⅓ FROM YEAR TO YEAR										
One Ton	£ s. d.	£ s. d.	£ s. d.	s. d.	s. d	s. d	s. d	s. d.	s. d.	£ s. d.
1. Linseed	1 9 6	0 11 9	0 9 10	6 7	4 5	2 11	1 11	1 3	0 10	2 2 2
2. Linseed cake	2 3 10	1 1 11	0 14 7	9 9	6 6	4 4	2 11	1 11	1 3	3 3 2
3. Decorticated cotton cake	3 7 4	1 13 8	1 2 5	14 11	9 11	6 7	4 5	2 11	1 11	4 16 9
4. Palm-nut cake	0 19 5	0 9 9	0 6 6	4 4	2 11	1 11	1 3	0 10	0 7	1 8 1
5. Undecortic't'd cotton cake	1 19 2	0 19 7	0 13 1	8 9	5 10	3 11	2 7	1 9	1 2	2 16 8
6. Cocoa-nut cake	1 13 9	0 16 11	0 11 3	7 6	5 0	3 4	2 3	1 6	1 0	2 8 9
7. Rape cake	2 11 7	1 5 10	0 17 3	11 6	7 8	5 1	3 5	2 3	1 6	3 14 6
8. Peas	1 9 6	0 11 9	0 9 10	6 7	4 5	2 11	1 11	1 3	0 10	2 2 6
9. Beans	1 14 11	0 17 6	0 11 8	7 9	5 2	3 5	2 3	1 6	1 0	2 10 3
10. Lentils	1 13 9	0 16 11	0 11 3	7 6	5 0	3 4	2 3	1 6	1 0	2 8 9
11. Tares (seed)	1 14 2	0 17 1	0 11 5	7 7	5 1	3 5	2 3	1 6	1 0	2 9 4
12. Indian corn	0 9 11	0 5 0	0 3 4	2 3	1 6	1 0	0 8	0 5	0 3	0 14 5
13. Wheat	0 12 1	0 6 1	0 4 1	2 9	1 10	1 3	0 10	0 7	0 5	0 17 10
14. Malt	0 10 8	0 5 4	0 3 7	2 5	1 7	1 1	0 9	0 6	0 4	0 15 7
15. Barley	0 10 6	0 5 3	0 3 6	2 4	1 7	1 1	0 9	0 6	0 4	0 15 4
16. Oats	0 13 4	0 6 8	0 4 5	2 11	1 11	1 3	0 10	0 7	0 5	0 19 0
17. Rice meal	0 12 0	0 6 0	0 4 0	2 8	1 9	1 2	0 9	0 6	0 4	0 17 2
18. Locust beans	—	—	—	—	—	—	—	—	—	—
19. Malt coombs	2 0 6	1 0 3	0 13 6	9 0	6 0	4 0	2 8	1 9	1 2	2 18 4
20. Fine pollard	1 8 8	0 14 4	0 9 7	6 5	4 3	2 10	1 11	1 3	0 10	2 1 5
21. Coarse pollard	1 12 0	0 16 0	0 10 8	7 1	4 9	3 2	2 1	1 5	0 11	2 6 1
22. Bran	1 13 1	0 16 7	0 11 1	7 5	4 11	3 3	2 2	1 5	0 11	2 7 9
DEDUCT ⅔ OF ORIGINAL MANURE-VALUE THE LAST YEAR, AND [illegible] FROM YEAR TO YEAR										
One Ton										
23. Clover hay	1 3 7	0 7 10	0 6 3	5 0	4 0	3 2	2 6	2 0	1 7	1 12 4
24. Meadow hay	0 15 5	0 5 2	0 4 2	3 4	2 8	2 2	1 9	1 5	1 2	1 1 10
25. Pea straw	0 9 3	0 3 1	0 2 6	2 0	1 7	1 3	1 0	0 10	0 8	0 12 11
26. Oat straw	0 4 9	0 1 7	0 1 3	1 0	0 10	0 8	0 6	0 5	0 4	0 6 7
27. Wheat straw	0 4 2	0 1 5	0 1 2	0 11	0 9	0 7	0 6	0 5	0 4	0 6 1
28. Barley straw	0 4 4	0 1 5	0 1 2	0 11	0 9	0 7	0 6	0 5	0 4	0 6 1
29. Bean straw	0 9 2	0 3 1	0 2 6	2 0	1 7	1 3	1 0	0 10	0 8	0 12 11
DEDUCT ½ OF ORIGINAL MANURE-VALUE THE LAST YEAR, AND [illegible] FROM YEAR TO YEAR										
Ten Tons										
30. Potatoes	1 12 6	0 16 3	0 10 10	7 3	4 10	3 3	2 2	1 5	0 11	2 6 11
31. Carrots	1 2 6	0 11 3	0 7 6	5 0	3 4	2 3	1 6	1 0	0 8	1 12 6
32. Parsnips	1 8 4	0 14 2	0 9 5	6 3	4 2	2 9	1 10	1 3	0 10	2 0 8
33. Mangel wurzels	1 7 6	0 13 9	0 9 2	6 1	4 1	2 9	1 10	1 3	0 10	1 19 9
34. Swedish turnips	1 5 10	0 12 11	0 8 7	5 9	3 10	2 7	1 9	1 2	0 9	1 17 4
35. Yellow turnips	1 1 8	0 10 10	0 7 3	4 10	3 3	2 2	1 5	0 11	0 7	1 11 3
36. White turnips	1 2 6	0 11 3	0 7 6	5 0	3 4	2 3	1 6	1 0	0 8	1 12 6

TABLE VII.—*Estimates of the Compensation-value of the Unexhausted Manures when Foods are consumed for the Production of Milk, starting from the Total or Original Manure-value.*

1. Assuming a yield of 12 quarts of milk per head per day.

Foods	Total or original manure-value, deducting constituents in milk only	Compensation value of unexhausted manures								
		First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh year	Eighth year	Total
DEDUCT ½ OF ORIGINAL MANURE-VALUE THE LAST YEAR AND ⅓ FROM YEAR TO YEAR										
One Ton	£ s. d.	£ s. d.	£ s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	£ s. d.
1. Linseed	1 7 1	0 13 7	0 9 1	6 1	4 1	2 9	1 10	1 3	0 10	1 19 6
2. Linseed cake	2 1 9	1 0 11	0 13 11	9 3	6 2	4 1	2 9	1 10	1 3	3 0 2
3. Decorticated cotton cake	3 5 4	1 12 8	1 1 9	14 6	9 8	6 5	4 3	2 10	1 11	4 11 0
4. Palm-nut cake	0 17 9	0 8 11	0 5 11	3 11	2 7	1 9	1 2	0 9	0 6	1 5 6
5. Undecorticated cotton cake	1 17 6	0 18 9	0 12 6	8 4	5 7	3 9	2 6	1 8	1 1	2 14 2
6. Cocoa-nut cake	1 12 3	0 16 2	0 10 9	7 2	4 9	3 2	2 1	1 5	0 11	2 6 5
7. Rape cake	2 10 4	1 5 2	0 16 9	11 2	7 5	4 11	3 3	2 2	1 5	3 12 3
8. Peas	1 7 8	0 13 10	0 9 3	6 2	4 1	2 9	1 10	1 3	0 10	2 0 0
9. Beans	1 13 1	0 16 7	0 11 1	7 5	4 11	3 3	2 2	1 5	0 11	2 7 9
10. Lentils	1 12 2	0 16 1	0 10 9	7 2	4 9	3 2	2 1	1 5	0 11	2 6 4
11. Tares (seed)	1 12 6	0 16 3	0 10 10	7 3	4 10	3 3	2 2	1 5	0 11	2 6 11
12. Indian corn	0 8 1	0 4 1	0 2 9	1 10	1 3	0 10	0 7	0 5	0 3	0 12 0
13. Wheat	0 10 5	0 5 3	0 3 6	2 4	1 7	1 1	0 9	0 6	0 4	0 15 4
14. Malt	0 9 0	0 4 6	0 3 0	2 0	1 4	0 11	0 7	0 5	0 3	0 13 6
15. Barley	0 8 8	0 4 4	0 2 11	1 11	1 3	0 10	0 7	0 5	0 3	0 12 6
16. Oats	0 11 7	0 5 10	0 3 11	2 7	1 9	1 2	0 9	0 6	0 4	0 16 10
17. Rice meal	0 10 5	0 5 3	0 3 6	2 4	1 7	1 1	0 9	0 6	0 4	0 15 4
18. Locust beans	—	—	—	—	—	—	—	—	—	—
19. Malt coombs	1 18 11	0 19 6	0 13 0	8 8	5 9	3 10	2 7	1 9	1 2	2 16 3
20. Fine pollard	1 6 11	0 13 6	0 9 0	6 0	4 0	2 8	1 9	1 2	0 9	1 18 10
21. Coarse pollard	1 10 5	0 15 3	0 10 2	6 9	4 6	3 0	2 0	1 4	0 11	2 3 11
22. Bran	1 11 8	0 15 10	0 10 7	7 1	4 9	3 2	2 1	1 5	0 11	2 5 10
DEDUCT ¼ OF ORIGINAL MANURE-VALUE THE LAST YEAR, AND ¼ FROM YEAR TO YEAR										
One Ton										
23. Clover hay	1 2 8	0 7 7	0 6 1	4 10	3 10	3 1	2 6	2 0	1 7	1 11 8
24. Meadow hay	0 14 5	0 4 10	0 3 10	3 1	2 6	2 0	1 7	1 3	1 0	1 0 1
25. Pea straw	0 8 5	0 2 10	0 2 3	1 10	1 6	1 2	0 11	0 9	0 7	0 11 10
26. Oat straw	0 4 0	0 1 4	0 1 1	0 10	0 8	0 6	0 5	0 4	0 3	0 5 5
27. Wheat straw	0 3 6	0 1 2	0 0 11	0 9	0 7	0 6	0 5	0 4	0 3	0 4 11
28. Barley straw	0 3 9	0 1 3	0 1 0	0 10	0 8	0 6	0 5	0 4	0 3	0 5 3
29. Bean straw	0 8 7	0 2 10	0 2 3	1 10	1 6	1 2	0 11	0 9	0 7	0 11 10
DEDUCT ½ OF ORIGINAL MANURE-VALUE THE LAST YEAR, AND ⅓ FROM YEAR TO YEAR										
Ten Tons										
30. Potatoes	1 10 10	0 15 5	0 10 3	6 10	4 7	3 1	2 1	1 5	0 11	2 4 7
31. Carrots	1 0 10	0 10 5	0 6 11	4 7	3 1	2 1	1 5	0 11	0 7	1 10 0
32. Parsnips	1 6 8	0 13 4	0 8 11	5 11	3 11	2 7	1 9	1 2	0 9	1 18
33. Mangel wurzels	1 5 10	0 12 11	0 8 7	5 9	3 10	2 7	1 9	1 2	0 9	1 17 4
34. Swedish turnips	1 4 2	0 12 1	0 8 1	5 5	3 7	2 5	1 7	1 1	0 9	1 13 0
35. Yellow turnips	1 0 10	0 10 5	0 6 11	4 7	3 1	2 1	1 5	0 11	0 7	1 10 0
36. White turnips	1 1 8	0 10 10	0 7 3	4 10	3 3	2 2	1 5	0 11	0 7	1 11 3

TABLE VIII.—*Estimates of the Compensation-value of the Unexhausted Manures when Foods are consumed for the Production of Milk, starting from the Total or Original Manure-value.*

5. Assuming a yield of 14 quarts of milk per head per day.

Foods	Total or original manure-value, deducting constituents in milk only	Compensation-value of unexhausted manures: Last year	Second year	Third year	Fourth year	Fifth year	Sixth year	S'v'nth year	Eighth year	Total
DEDUCT $\frac{1}{2}$ OF ORIGINAL MANURE-VALUE THE LAST YEAR, AND $\frac{1}{3}$ FROM YEAR TO YEAR										
One Ton	£ s. d.	£ s. d.	£ s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	£ s. d.
1. Linseed	1 4 5	0 12 3	0 8 2	5 5	3 7	2 5	1 7	1 1	0 9	1 15 3
2. Linseed cake	1 19 8	0 19 10	0 13 3	8 10	5 11	3 11	2 7	1 9	1 2	2 17 3
3. Decorticated cotton cake	3 3 4	1 11 8	1 1 1	14 1	9 5	6 3	4 2	2 9	1 10	4 11 3
4. Palm-nut cake	0 15 11	0 8 0	0 5 4	3 7	2 5	1 7	1 1	0 9	0 6	1 3 3
5. Undecortic't'd cotton cake	1 15 11	0 18 0	0 12 0	8 0	5 4	3 7	2 5	1 7	1 1	2 12 0
6. Cocoa-nut cake	1 10 6	0 15 3	0 10 2	6 9	4 6	3 0	2 0	1 4	0 11	2 3 11
7. Rape cake	2 9 1	1 4 7	0 16 5	10 11	7 3	4 10	3 3	2 2	1 5	3 10 10
8. Peas	1 5 9	0 12 11	0 8 7	5 9	3 10	2 7	1 9	1 2	0 9	1 17 4
9. Beans	1 11 4	0 15 8	0 10 5	6 11	4 7	3 1	2 1	1 5	0 11	2 5 1
10. Lentils	1 10 1	0 15 1	0 10 1	6 9	4 6	3 0	2 0	1 4	0 11	2 3 8
11. Tares (seed)	1 10 7	0 15 4	0 10 3	6 10	4 7	3 1	2 1	1 5	0 11	2 4 6
12. Indian corn	0 6 5	0 3 3	0 2 2	1 5	0 11	0 7	0 5	0 3	0 2	0 9 2
13. Wheat	0 8 8	0 4 4	0 2 11	1 11	1 3	0 10	0 7	0 5	0 3	0 12 6
14. Malt	0 7 1	0 3 7	0 2 5	1 7	1 1	0 9	0 6	0 4	0 3	0 10 6
15. Barley	0 6 11	0 3 6	0 2 4	1 7	1 1	0 9	0 6	0 4	0 3	0 10 4
16. Oats	0 9 10	0 4 11	0 3 3	2 2	1 5	0 11	0 7	0 5	0 3	0 13 11
17. Rice meal	0 8 7	0 4 4	0 2 11	1 11	1 3	0 10	0 7	0 5	0 3	0 12 6
18. Locust beans	—	—	—	—	—	—	—	—	—	—
19. Malt coombs	1 17 4	0 18 8	0 12 5	8 3	5 6	3 8	2 5	1 7	1 1	2 13 7
20. Fine pollard	1 5 3	0 12 8	0 8 5	5 7	3 9	2 6	1 8	1 1	0 9	1 16 5
21. Coarse pollard	1 8 9	0 14 5	0 9 7	6 5	4 3	2 10	1 11	1 3	0 10	2 1 6
22. Bran	1 10 3	0 15 2	0 10 1	6 9	4 6	3 0	2 0	1 4	0 11	2 3 9
DEDUCT $\frac{1}{3}$ OF ORIGINAL MANURE-VALUE THE LAST YEAR, AND $\frac{1}{5}$ FROM YEAR TO YEAR										
One Ton										
23. Clover hay	1 1 8	0 7 3	0 5 10	4 8	3 10	3 1	2 6	2 0	1 7	1 10 9
24. Meadow hay	0 13 7	0 4 6	0 3 7	2 10	2 3	1 10	1 6	1 2	0 11	0 18 7
25. Pea straw	0 7 8	0 2 7	0 2 1	1 8	1 4	1 1	0 10	0 8	0 6	0 10 9
26. Oat straw	0 3 3	0 1 1	0 0 10	0 8	0 6	0 5	0 4	0 3	0 2	0 4 3
27. Wheat straw	0 3 0	0 1 0	0 0 10	0 8	0 6	0 5	0 4	0 3	0 2	0 4 2
28. Barley straw	0 3 2	0 1 1	0 0 10	0 8	0 6	0 5	0 4	0 3	0 2	0 4 3
29. Bean straw	0 8 0	0 2 8	0 2 2	1 9	1 5	1 2	0 11	0 9	0 7	0 11 5
DEDUCT $\frac{1}{2}$ OF ORIGINAL MANURE-VALUE THE LAST YEAR, AND $\frac{1}{3}$ FROM YEAR TO YEAR										
Ten Tons										
30. Potatoes	1 9 2	0 14 7	0 9 9	6 6	4 4	2 11	1 11	1 3	0 10	2 2 1
31. Carrots	0 19 2	0 9 7	0 6 5	4 3	2 10	1 11	1 3	0 10	0 7	1 7 8
32. Parsnips	1 5 10	0 12 11	0 8 7	5 9	3 10	2 7	1 9	1 2	0 9	1 17 4
33. Mangel wurzels	1 4 2	0 12 1	0 8 1	5 5	3 7	2 5	1 7	1 1	0 9	1 15 0
34. Swedish turnips	1 2 6	0 11 3	0 7 6	5 0	3 4	2 3	1 6	1 0	0 8	1 12 6
35. Yellow turnips	1 0 0	0 10 0	0 6 8	4 5	2 11	1 11	1 3	0 10	0 7	1 8 7
36. White turnips	1 0 0	0 10 0	0 6 8	4 5	2 11	1 11	1 3	0 10	0 7	1 8 7

per head per day respectively, in the five Tables—IV., V., VI., VII., and VIII. (pp. 112–116). In each case, the first column shows the *total or original manure-value* of the food; the second the allowance for the last year, the succeeding seven columns that for each year back to the eighth; and the last column gives the *total compensation-value* for eight years' consumption.

The estimates are thus fully given for a minimum yield of 6, and for a maximum of 14, quarts per head per day; also for the three intermediate amounts of 8, 10 and 12 quarts. The range of the results will, therefore, probably cover all the requirements of valuation in actual practice. It may be added, that amounts intermediate between any two of those provided for in the tables may be obtained by taking the mean of the two.

Although we have thus, in the five Tables IV. to VIII., adopted the same scale of reduction from the *total or original* manure-value from year to year, when food is consumed for the production of milk, as when the consumption is for fattening increase, it must be borne in mind that, when cows are fed in sheds or yards, the manure is generally liable to greater losses than is the case with fattening oxen. The manure from the cow contains much more water in proportion to solid matter than that of the ox. Water will, besides, frequently be used for washing, and it may be that a good deal of the manure is washed into drains and lost. In the event, therefore, of a claim for compensation, the management and disposal of the manure requires the attention of the valuer. Indeed, the varying circumstances that will arise in practice must be carefully considered. Bearing these in mind, the estimates may be accepted as at any rate the best approximation to the truth that existing knowledge enables us to provide; and they will, we hope, be found sufficient for the requirements of practical use. Obviously, they will be more directly applicable in the case of cows feeding entirely on the foods enumerated in the list, and not depending largely on grass; but even when the animals are partially grass-fed, the value of the manure derived from the additional dry food, or roots, may be estimated according to the scale given.

For any further particulars relating to the general question of the valuation of the manures obtained by the consumption of food-stuffs, we must refer to the full discussion of the subject in our paper in the last number of the Journal.

Rothamsted.

JOHN BENNET LAWES,
J. HENRY GILBERT.

Official Reports.

ANNUAL REPORT FOR 1897 FROM THE PRINCIPAL OF THE ROYAL VETERINARY COLLEGE.

During the past year, 302 morbid specimens have been sent by veterinary surgeons and others to the Laboratory for original research in Comparative Pathology and Bacteriology, which was established at the Royal Veterinary College in 1890, and which has been since maintained by the aid of an annual grant of 500*l.* from the Royal Agricultural Society. In addition to the work involved in examining and reporting upon those specimens, many of which demanded a microscopic examination, a number of experimental investigations have been carried out with a view to throwing fresh light on the cause, treatment, or prevention of several important diseases. The following is an account of the more important of these.

Glanders.

It is gratifying to have to report that there has been a great increase in the demand for mallein during 1897, the number of doses supplied (free of charge) to veterinary surgeons during the twelve months being 3,032, as compared with 1,464 doses in 1896. The increased demand is evidence of the reliability of this substance in the diagnosis of glanders. It is prepared by cultivating the glanders bacillus in a suitable liquid medium and in a state of purity for several weeks, and then sterilising the liquid and filtering it in order to get rid of the dead bacilli. When injected in moderate dose under the skin of a horse that is not the subject of glanders, it has no appreciable effect on the animal's temperature, and provokes only a small transient swelling at the place where it was injected. On the other hand, when a small dose of mallein is injected under the skin of a horse that is the subject of glanders, even although the disease may not be manifested by any external symptom, a sharp attack of fever, lasting for about twenty-four hours, is excited, and a considerable swelling forms at the point of injection and persists for two or three days.

When glanders breaks out in a stud it is thus possible to ascertain with great certainty which animals have already contracted the disease—a piece of information that was not obtainable prior to the discovery of mallein. By the sacrifice of the horses that react to mallein it is thus generally possible to stamp out an outbreak of glanders at comparatively small cost, whereas, without mallein, this is scarcely possible by any less expensive measure than the slaughter

of every horse that is known to have been exposed to the contagion. This fact deserves to be better known, for on a comparatively recent occasion a local authority caused to be slaughtered an entire stud of about 40 horses without having recourse to mallein, and thus doubtless made a needless sacrifice of a considerable number of healthy animals.

Rabies.

During the year 1897, 31 cases in which rabies was suspected were referred to the laboratory for experimental investigation. In 29 cases the animal suspected was a dog, in one case it was a cow, and in another a sheep. In 17 of the cases the experiments proved that the suspected animal had been the subject of rabies (15 dogs, one cow, and one sheep); in 13 cases they showed that the animal had not been rabid, and in one case the experiments did not warrant a positive diagnosis.

In most of the cases only the head or brain of the suspected animal was forwarded to the laboratory, but in a few instances the entire carcass was sent, and in view of the interest at present attaching to the subject of rabies, and more particularly to the means of diagnosing that disease, it may be well to describe here in some detail the methods by which a diagnosis may be arrived at.

In the first place it may be observed that where an opportunity is afforded to a veterinary surgeon to observe the suspected animal throughout the course of its illness a diagnosis approaching to certainty may be made in most cases. One of the earliest symptoms is restlessness and abnormal excitability. As a rule this is soon followed by a disposition to roam, and a pronounced tendency to attack other dogs. This has repeatedly been observed in cases reported to the laboratory, though unfortunately it did not always immediately excite a suspicion that the dog was developing rabies. One of the series of cases investigated during the past year was that of a beagle, and after the experimental inoculations had left no doubt that the dog had been rabid, inquiry as to the symptoms exhibited prior to death elicited the fact that on the last occasion when the pack was hunted this dog, previously well trained and peaceable, displayed a suddenly acquired viciousness, and frequently, in the course of the day, flew upon other members of the pack. In this case, fortunately, no human being was afterwards bitten by the dog, but it has too frequently happened that, after the rabid dog has made an unprovoked attack on some person or persons, his owners have recollected that they had noticed with some surprise an unwonted pugnacity towards other members of his own species. In some cases this biting propensity is never displayed towards other animals or man, but as a rule in the later stages any living thing which comes in the way of a rabid dog is apt to be attacked. Moreover, even at a comparatively early stage of the disease there is great danger in handling rabid animals, for they will then frequently bite even those to whom they are attached, and whom they still recognise.

Simultaneously with the onset of the tendency to wander from home and the propensity to bite, the appetite for ordinary food is lost, but thirst is present and is frequently combined with a morbid inclination for such matters as straw, dung, chips of wood, &c. The animal rapidly loses condition, and becomes haggard-looking, the eyes assume a peculiar staring expression, and difficulty of swallowing sets in. In the so-called dumb rabies the lower jaw, as well as the muscles of the throat, become paralysed, and if suspicion has not been excited by the other symptoms the owner is apt to think that the dog has something sticking in his throat. In a considerable number of cases the dog which has left his home returns in the course of a few days, footsore, dirty, emaciated, and haggard-looking. The tone of his bark or howl is distinctly altered, he refuses all food, frequently develops symptoms of paralysis of his hind quarters, and dies within a day or two. In the great majority of cases death results within five or six days of the onset of distinct symptoms.

Unfortunately it often happens that the rabid dog which has left his home continues to roam until, in some locality where he cannot be identified, attention is attracted to him on account of his having bitten human beings or some of the lower animals. Too frequently the only history obtainable is that the dog was killed because he had bitten some one, and nothing can be learned as to whether any of the above-described symptoms, which are of great diagnostic importance, had been exhibited. And that leads up to the question of the value of a *post-mortem* examination in the diagnosis of rabies.

In the experience of the writer there is only one organ of the body whose state furnishes evidence of any value at the *post-mortem* examination of a dog suspected of rabies. That organ is the stomach. When that is healthy in appearance and filled with ordinary food materials, it may, with a confidence that is little short of certainty, be declared that the dog in question was not rabid. On the other hand, if the stomach is empty of ordinary food materials, but contains a notable quantity of such foreign substances as hay, straw, wood-shavings, &c., in the case of a dog that has bitten anyone, or displayed any of the symptoms of rabies previously described, there remains very little room for doubt that the animal was rabid.

Circumstances connected with one of the cases referred to the laboratory during the past year are interesting in this connection. In this case the dog was killed after he had made unprovoked attacks on several people and bitten them. The dog was a stranger to the district, and his previous history could not be traced. The carcass was sent to the Royal Veterinary College, and the *post-mortem* revealed a condition which appeared to be opposed to the conclusion that the dog was mad, viz. the presence of a considerable quantity of animal food, mixed with some hair, in an apparently healthy stomach. Notwithstanding this, in view of the history that the dog had bitten several people without provocation, it was

at once reported that the case was almost certainly one of rabies. This opinion was verified by experimental inoculations, and subsequent inquiry removed the apparent conflict between the clinical history and the condition of the stomach. It was ascertained that on the day on which the animal was killed it had wandered into a machinery shed, and been seen by one of the workmen to eat a quantity of grease for lubricating machinery. At the *post-mortem* examination this had been mistaken for animal fat.

With the foregoing exception, in every case of rabies that has come under notice at the Royal Veterinary College within recent years, the stomach was empty save for a little brownish liquid (saliva and mucus) or foreign bodies of the kind already mentioned.

When the stomach contains neither food materials nor foreign substances, and there is no clinical history to fall back upon, there remains only one way by which a diagnosis can be made, viz. by resorting to the experimental inoculation of animals. The rabbit is the animal generally selected for such experiments, and the material used to inoculate is taken from the brain of the suspected dog. This material is injected under the coverings of the rabbit's brain, and when it is taken from the fresh brain of a rabid dog it leads with great certainty to the development of the same disease in the inoculated rabbit.

In the experiments made in the laboratory during the past year, the average period of incubation in the rabbits was 16 days.

It has been asked whether the inoculation test is a perfectly reliable one, and this may be answered by saying that when the brain to be tested is fresh, and a sufficient number of experimental animals are employed (at least three), the results enable one to say positively whether the case was one of rabies or not. Even when the brain is partially putrid a positive opinion may be justified by the experiments, but the test may, in such a case, fail, owing to the death of the inoculated animals from septic inflammation of the brain before the rabic virus has had time to develop. Apart from that source of failure, experiments made with quite putrid brains are not absolutely reliable, for putrefaction weakens the rabic virus and ultimately destroys it. In the case previously referred to, in which the experiments left the nature of the case in doubt, the brain was very putrid, and five out of six rabbits inoculated from it died within a few days from septic inflammation of the coverings of the brain. The sixth rabbit survived, and did not subsequently develop any symptom of rabies. Nevertheless, it was not considered safe to report the case as certainly not rabies.

The cow whose brain was tested experimentally was the second case in the same herd, and the symptoms were characteristic of rabies in the ox species. They were described by the veterinary surgeon in attendance as follows: "The cows at the outset roamed about the fields away from the other animals. Although both in calf, they displayed inordinate sexual desire. Occasionally they bellowed in an unnatural tone, and attacked the other animals with

their horns. They scraped the ground with the fore feet, the expression was staring, and there was slight salivation. Now and again they would seize a mouthful of hay, and, after masticating it for a little, drop it out of the mouth. Later on they became stupid, drowsy-looking, and finally paralysed in the hind quarters. They died in about 15 hours after the paralysis set in, and the whole course of the illness was about four days. The temperature of one taken a few hours before death was 103° F."

There was no history of these cows having been bitten, but about two months previously there had been two suspected cases of rabies in the dog within a short distance of the farm.

Tuberculosis in Cattle.

During the past year the results of the tuberculin test on an aggregate of 1,109 animals (nearly all cows) were communicated to the laboratory by members of the veterinary profession, and out of that number 426, or 38·4 per cent., reacted. This percentage becomes more alarming when it is stated that with few exceptions the animals tested were apparently healthy, and that in the great majority of the cases it was not suspected by the owner that the disease was specially prevalent in his herd. In short, it must reluctantly be confessed that there are no grounds for believing that the above figures represent an exceptional state of affairs for the class of animals, viz. dairy cows, in this country. These figures were reported by 27 different veterinary surgeons, as follows :—

No. of animals tested	No. reacted	No. of animals tested	No. reacted
18	4	38	25
56	0	48	29
88	12	24	10
6	5	12	18
18	7	17	3
25	1	41	29
213	129	115	0
58	31	17	3
1	0	5	5
11	8	8	5
43	28	41	35
1	1	6	0
36	2	105	19
28	17		
		1,109	426

Assuming for the moment that a reaction to tuberculin may be accepted as conclusive evidence of the existence of tuberculous disease, and that the results obtained in the hands of these 27 veterinary surgeons are not exceptional, the figures prove that tuberculosis is more common among dairy cows in this country than anyone has hitherto imagined, and they also show that the disease is very unequally distributed, some herds having only a small pro-

portion of animals affected, others a large proportion, and a few being quite free from the disease.

The figures are calculated to give pause to those who have been inclined to urge a policy of compulsory stamping out of tuberculosis, with or without compensation to the owners of slaughtered animals.

But it may possibly be thought by some that a reaction to tuberculin is not conclusive evidence of tuberculosis, and that therefore these figures may not be reliable as an indication of the extent to which the disease exists among British cattle. Unfortunately there is no justification for thinking that there can be any serious error in the figures given above, for nothing is more solidly established by experience than that the tuberculin test when properly carried out is, if not infallible, at least subject to only a small margin of error. But although the trustworthiness of tuberculin is no longer open to discussion, it may be worth while to describe here some observations bearing on that question which were made at the Royal Veterinary College during the past twelve months.

During that period 42 animals that had recently been tested with tuberculin were submitted to *post-mortem* examination, and the results are set forth on p. 124 in tabular form. The 42 animals came from two different herds.

Before analysing this table it is necessary to explain what is meant by a reaction to tuberculin. It may be defined as a *gradual* rise of temperature, during the sixteen hours following the injection, from the normal (101°–102° F.) to 104° or more. When that takes place the animal must be considered tuberculous. When during the same period the temperature shows no appreciable rise there is an absence of reaction, which indicates that the animal is free from tuberculosis. In a small proportion of cases the temperature rises, but does not quite reach 104°, and such cases have generally to be considered doubtful, and tested again after an interval of a month or more.

With this explanation the table may now be analysed, and it will be seen that of the 42 animals five had no reaction, in two the temperature rose but did not attain 104°, and in the remaining 35 the maximum temperature varied from 104° to 107·6°. In reality, however, one of the latter (No. 26) did not react, for although the temperature rose to 105·8°, its ascent was not gradual, but quite sudden at the fifteenth hour. The *post-mortem* examination revealed no tuberculous lesion in the animal, but it disclosed a diseased condition of the uterus. Probably the rise of temperature was caused by this condition, and in no way connected with the injection of tuberculin. Excluding this case, 34 animals had a decided reaction, and all of these were found to be tuberculous. In two there was a doubtful reaction, and these also were tuberculous. Of the five that did not react, four, in spite of a prolonged and careful search, appeared to be free from tuberculous disease, and in the fourth a single tubercle was found in one lymphatic gland. More

No.	Reaction to tuberculin	Organs in which tuberculous lesions were found
1	To 104° .	Bronchial and mediastinal lymphatic glands and left lung
2	To 106·3° .	Bronchial and mediastinal glands
3	To 105·8° .	Left bronchial gland
4	To 105 7° .	Bronchial, mediastinal and mesenteric glands and both lungs
5	To 105·8° .	Bronchial and pharyngeal glands and right lung
6	To 104 9° .	Bronchial, mediastinal and mesenteric glands, right lung, pleura and glands of liver
7	None .	None
8	To 105·8° .	Pharyngeal and mediastinal glands
9	To 106° .	Bronchial, mediastinal, mesenteric and pharyngeal glands
10	To 106° .	Bronchial, mediastinal, mesenteric and hepatic glands and right lung
11	To 104° .	Bronchial and mediastinal glands and right lung
12	To 107·6° .	Both lungs and mediastinal gland
13	To 106 6° .	Bronchial and mediastinal glands
14	To 107·6° .	Bronchial and mediastinal glands
15	To 105·8° .	Bronchial and mediastinal glands
16	To 106° .	Bronchial, mediastinal and pharyngeal glands, and right lung
17	To 106° .	Bronchial and mediastinal glands and left lung
18	To 103 6° .	Left bronchial gland
19	None .	None
20	To 106° .	Bronchial, mediastinal, hepatic and mesenteric glands and both lungs
21	To 104 3° .	Right bronchial gland
22	To 105 8° .	Mesenteric glands and both lungs
23	To 106° .	Bronchial, mediastinal and mesenteric glands
24	None .	Mediastinal gland
25	To 106° .	Bronchial and mediastinal glands
26	To 105·8, but temperature curve abnormal	No tuberculous lesions, but inflammation of the womb with fluid accumulation in its cavity
27	None .	None
28	To 106° .	Bronchial and mediastinal glands
29	To 105 4° .	Bronchial, mediastinal, pharyngeal, hepatic and mesenteric glands and both lungs
30	To 106° .	Bronchial, mediastinal and mesenteric glands, and right lung
31	To 103 8° .	Bronchial and mediastinal glands
32	To 106·4° .	Bronchial and mediastinal glands and right lung
33	To 106 2° .	Bronchial and mediastinal glands and both lungs, mesenteric glands, pleura, peritoneum, and left mammary lymphatic gland
34	To 104° .	Mediastinal gland
35	To 106° .	Bronchial glands
36	To 106° .	Bronchial, mediastinal, and splenic glands, liver, and right lung
37	To 105·8° .	Bronchial, mediastinal and mesenteric glands, and right lung
38	To 106 7° .	Right bronchial gland
39	To 107·5° .	Bronchial and mediastinal glands
40	To 106·4° .	Bronchial and mesenteric glands and left lung
41	Reacted, but highest temperature not reported	Bronchial and mediastinal glands
42	None .	None

than a month had elapsed between the time when the animal was tested and the date when it was killed, but the tubercle was as large as a pea, distinctly caseous, and almost certainly more than a month old.

Congenital Tuberculosis.

During the latter part of 1896, through the medium of the "Veterinary Record," a reward of one guinea was offered for each tuberculous new-born calf sent to the Research Laboratory at the Royal Veterinary College. This offer was made in consequence of a correspondence which was then being carried on in the columns of the before-mentioned journal, and in which several veterinary surgeons, on the alleged ground of their own experience, strongly dissented from the view maintained by the writer of this report to the effect that tuberculous disease is very rarely present in calves at birth, even when one or other parent is affected with that disease. In consequence of this offer three calves supposed to be the subjects of congenital tuberculosis were forwarded to the Laboratory during the succeeding twelve months, but only one of these was an example of the condition asked for. In one of the other two cases the lesions which were present in the liver had only a distant resemblance to true tubercles, and both by microscopic examination and by inoculative experiments their non tuberculous nature was clearly established. In the remaining case the lesions were undoubtedly tuberculous, but the calf appeared to be at least five or six weeks old, and the stage of the disease did not make it at all certain that the calf had been infected prior to birth.[1] This case is interesting as an illustration of the common tendency of those who favour the view that tuberculosis is generally, or at least frequently, inherited, to regard every case of the disease in young animals as an example of congenital tuberculosis. It hardly needs to be explained that a period of even a few weeks of extra-uterine life is quite sufficient to admit of the development of distinct lesions in a calf that was quite healthy when it came into the world.

As a matter of fact, the calf which was accepted as an example of congenital tuberculosis was killed five days after birth, but the lesions discovered in it were at a stage which made it impossible to doubt that they had been in existence before birth. This calf was forwarded by Mr. Holroyd, M.R.C.V.S., Manchester, and the fact that the cow which gave birth to it was killed a short time afterwards and submitted to *post-mortem* examination adds to the interest of the case. The cow in question was recognised to be in the last stages of tuberculosis before she calved, and after death she was found to be the subject of very widespread disease, involving, among other organs, the womb itself.

This case does not lend the least support to the view that in any notable proportion of cases tuberculosis is transmitted from the cow to the calf while the latter is still in the uterus, nor does it

[1] The reward of one guinea was nevertheless paid for this calf also.

weaken the position of those who maintain that in the vast majority of cases a cow that is herself tuberculous will bear perfectly healthy calves. It has never been maintained by anyone that the intra-uterine transmission of the disease never occurs, and it is generally admitted that when the uterus is the seat of tuberculous disease there is a great risk, though not even then a certainty, that the calf will be born tuberculous. But it is maintained that with a healthy uterus, no matter what the extent of the tuberculous disease is elsewhere, the progeny are probably never born tuberculous, and there is abundant experience to prove that the uterus is not one of the common seats of the disease in tuberculosis of the cow.

It has also been asserted by those who believe in the frequent occurrence of congenital tuberculosis that the testicles are not rarely the seat of tuberculous disease, and this statement is put forward as if it afforded an explanation of the alleged frequency of tuberculosis in the progeny of particular bulls. During the past year several testicles from rams and bulls were sent to the Laboratory for examination, and one of these was found to be the seat of genuine tuberculous disease, while the others were either healthy or showed other structural alterations easily distinguished from true tubercles. Again it may be said that the occurrence of tuberculous disease of the testicle of the bull has never been denied, but the condition is still rarer than tuberculosis of the womb, and on that account has even less bearing than the latter on the general question of congenital tuberculosis.

Finally in connection with this subject it may be pointed out that the question as to the relative frequency with which tuberculosis is transmitted from the mother to the unborn fœtus, and the influence which that ought to have on measures devised to prevent or eradicate the disease, has almost entirely lost its importance since the discovery of tuberculin. When a pregnant cow has reacted to tuberculin it is waste of time to discuss the probability of her calf being tuberculous, since the tuberculin test can be employed to settle that when the calf is born.

Generalised Tuberculosis.

The following experiments were carried out with the object of ascertaining, at the *post-mortem* examination of an animal affected with tuberculosis, what are the most valuable naked-eye indications that the disease has become generalised. This question is one of much importance in connection with the practice of meat inspection. At the present time the extreme position that was at one time taken up by a good many persons with regard to the necessity for condemning all tuberculous carcasses, has been generally abandoned. Such a course is at present almost impossible on economic grounds, owing to the very large proportion of cases in which cattle are in some degree tuberculous, and in the hands of the most trustworthy observers experiments have indicated that such an extreme policy

as general wholesale condemnation is not necessary in the interests of public health. It would appear that these interests would be sufficiently safeguarded by the withdrawal from consumption of those cases in which the disease affects the edible portions of the carcass, or in which there are indications that tubercle bacilli have been carried into every part of the body by way of the blood stream. But opinions are not unanimous as to what are the most reliable indications that such dissemination of tubercle germs in the circulating blood has actually taken place. In this country the practice of meat inspectors in this matter has not yet been regulated by authoritative enactment, but in France, Germany, and some other Continental states, an attempt has been made to define by law the conditions in which carcasses are to be passed or condemned on account of tuberculous disease. Thus, in France there is an order by the Minister of Agriculture, dated September 28, 1896, which defines the conditions under which the carcasses of tuberculous animals are to be totally condemned, as follows :—

1. When the tuberculous lesions, whatever their importance, are accompanied by emaciation.
2. When tubercles are present in the muscles or in the intra-muscular lymphatic glands.
3. When generalisation of the tuberculosis is manifested by miliary eruptions in all the organs (*tous les parenchymes*) and notably in the spleen.
4. When important tuberculous lesions are present at the same time in the organs of the thoracic cavity, and in those of the abdomen.

The experiments described below bear especially on the third of the preceding paragraphs, which must be construed to mean that the spleen is the organ whose condition is of most value when one has to determine whether in any given animal tuberculosis has become generalised or not. There would appear to be two methods of ascertaining whether this view is the correct one or not. The first would be to take a series of cows in which tuberculous lesions are present in the spleen, and by experimental inoculations or otherwise determine whether in those cases all the other organs of the body had been infected with tubercle bacilli. This method is difficult to carry out, owing to the fact that, at least in adult cattle, tuberculous lesions, miliary or of any other character, are very rarely met with in the splenic substance. And it may be remarked that this at the very outset is calculated to raise doubts as to the correctness of the view that generalisation of the disease is always manifested by an eruption of miliary tubercles in that organ.

The second method of obtaining information on the point in doubt consists in experimentally producing generalisation of the disease, and then observing what are the seats of the lesions thus induced. To set up a generalised tuberculosis it suffices to inject a sufficient number of virulent tubercle bacilli directly into the jugular vein, and that is what was done in the following experiments.

Experiment.

A piece of horse's mesenteric gland, previously ascertained by microscopic examination to be very rich in tubercle bacilli, was rubbed up in a sterile mortar with a quantity of bouillon; a cover-glass preparation made from the resulting mixture showed immense numbers of tubercle bacilli in every field of the microscope. Three cubic centimetres of the mixture were injected into the left jugular of one cow (No. 1) and two cubic centimetres into the same vessel of another cow (No. 2). This experiment was performed on May 18.

Cow No. 1 was killed on June 10 when unable to rise, and the following are the notes of the *post-mortem* examination:—

Carcass very emaciated. Blood not noticeably anæmic. Udder and its lymphatic glands normal.

Parietal and visceral peritoneum normal. Peritoneal cavity contains a small quantity of clear, serous fluid. Mesenteric glands normal.

Spleen normal in size; weighs 13 oz. Pulp normal in appearance; Malpighian bodies distinctly visible.

Kidneys normal in size; together they weigh 2 lb. 4 oz. Normal in appearance on section.

Liver shows slight cirrhosis of the large bile ducts, which contain a few flukes. Hepatic lymphatic glands normal. Liver weighs 14 lb. Adjoining its lower edge there are four spots of localised fatty infiltration, the largest somewhat larger than a garden bean. There is a somewhat smaller spot near the gall-bladder. The lobulation is very indistinct, but no tubercles are visible in the organ on section.

Right bronchial glands enlarged; the largest is four inches long and as thick as two fingers. A turbid juice exudes from the cut surface. The cortical part of the gland is of a dullish white colour, and the medulla is grey. No trace of caseation. Another bronchial gland of this group is as big as a walnut, and still another is half this size; same appearance on section. The left bronchial glands constitute a firm mass as big as a goose egg, and on section they present a similar appearance. Some of the tracheal glands are enlarged to the size of a walnut, and are juicy on section. Mediastinal gland about five inches long, and as thick as three fingers.

Both lungs show extensive interlobular and subpleural emphysema. The lung parenchyma is uniformly filled with miliary tubercles; these are so close as to be almost confluent. The tubercles are translucent, and about the size of a mustard seed. At some places the lung tissue is quite solid from their confluence.

Heart and pericardium normal.

Precrural, inguinal, and pelvic lymphatic glands normal, as are also those of the large intestine and stomach. Prepectoral, submaxillary, pharyngeal, brachial, suprasternal, prescapular and popliteal glands normal.

Cow No. 2 was killed on June 23. She was then very ill, and her respiration was gasping. The following are the notes of the *post-mortem* examination:—

The carcass is emaciated. The udder and its lymphatic glands are normal. The peritoneum is normal. The mesenteric glands and those of the large intestine are normal. The spleen weighs a little over 1 lb.; it is normal in appearance, and no tubercles are visible in its pulp. There is an adhesion between the second stomach and the diaphragm, and the adjacent lymphatic glands are enlarged, and contain thick yellow pus. The fourth stomach contains a bullet and several pieces of wire, and its mucous membrane is transfixed by a pin. The liver is normal in size, and no tubercles are visible in it. The kidneys are normal in size; together they weigh 2 lb. 13 oz. No

tubercles are visible in their substance on section. The ovaries are normal. The right horn of the uterus contains a quantity of chocolate-coloured fluid. The pericardium and heart are normal. The pleura is normal. The bronchial glands are enlarged to about the size of one's fist. The mediastinal gland is six inches in length by three in diameter. The cortex in all these glands is beset with opaque tubercles. Throughout both lungs the lobules are almost everywhere partially disassociated by interlobular emphysema; there is also considerable subpleural emphysema. In both lungs the parenchyma is uniformly filled with grey opaque tubercles. One of the pharyngeal glands on the left side is enlarged to the size of a hen's egg, and on section it shows numerous opaque tubercles, the intervening gland substance being congested. On the same side the prescapular gland, although normal in size, shows a few distinct tubercles in the cortex when cut. The axillary and submaxillary glands on the same side are normal. The prescapular gland on the right side is a little larger than the one on the left, but it shows no visible tubercles. The submaxillary, axillary and pharyngeal glands on the right side are normal. The following groups of glands are normal on both sides—prepectoral, inguinal, sublumbar, popliteal and suprasternal.

This experiment bears out the conclusion that not the spleen but the lungs are of most value when an inspector has to decide whether a case is one of generalised tuberculosis or not. In both of these cases if the carcass had been accompanied by the spleen, liver, and kidneys, but not by the lungs, it might have been passed as fit for consumption in any slaughter-house. On the other hand, if the lungs had been submitted with the carcass, even in the absence of all the other organs, the presence of a uniform crop of miliary tubercles in the pulmonary tissue would have furnished unmistakable evidence that the disease had been generalised by way of the blood stream, and that the carcass was therefore dangerous for human food. And it is an important point that not even a microscopic examination of the liver, spleen, or kidneys in either of these cases would have indicated that the carcass was dangerous, for as a matter of fact such an examination has been made, and no tubercles have been discovered in these organs.

Black-quarter.

No reliable statistics regarding the prevalence of this disease in Great Britain are available, but there can be little doubt that in many districts it is the chief scourge of young stock, and the cause of far more serious loss than anthrax, although the latter is a scheduled disease under the Diseases of Animals Act, and the object of a good deal of attention on the part of the Board of Agriculture and local authorities.

Considerable light has been thrown on the cause of quarter-evil during recent years, but in several respects it is still an ill-understood disease.

It is perfectly certain that the actual cause of the disease is a bacillus, which, although for the most part rod-shaped, is quite different both in size and outline from the bacillus of anthrax. The proof that this germ is the cause of the disease rests upon the fact

that it is invariably present in enormous numbers in the crackling swellings which are characteristic of black-quarter, and that with any material containing these bacilli one can by inoculation communicate the disease to young cattle. But while it is now on all hands admitted that this bacillus is the cause of quarter-evil, it is not yet quite clear how the disease is generally contracted or spread. It would naturally occur to one that it may be spread, as anthrax almost invariably is, by bacilli or their spores taken in with food or water, but apparently this supposition must be discarded, owing to the fact that almost all attempts to communicate the disease in this way have failed. The only certain method of infecting an animal experimentally is by subcutaneous or intramuscular inoculation, and since there is reason to believe that the black-quarter germ is naturally present in the soil in some localities it is possible that most cases of the disease are caused by the entrance of dirt into small wounds about the feet or elsewhere.

As a disease of the sheep, black-quarter has received little or no attention, and there is a very general belief that only young cattle are subject to it. This, however, is a mistake, for on several occasions within the last few years observations made in the laboratory at the Royal Veterinary College have shown that cases of sudden death among sheep were due to genuine black-quarter. One of the most interesting of these observations was made during the past year. Recourse was had to the laboratory in order to have it ascertained what was the cause of death on three contiguous farms where there was a heavy annual loss among the sheep. A visit was paid to one of these farms in the hope that an opportunity to examine a sheep recently dead might be obtained. On arrival it was ascertained that a lamb had died on the previous day, and that it had been kept for examination. Unfortunately, it was now much decomposed, as the time was midsummer, but when the skin was removed there was discovered a dark blood-stained patch involving the subcutaneous and muscular tissue of one of the hind legs. Subsequent examination, made after return to the Laboratory, showed that the tissues of this part were swarming with putrefactive organisms, but no bacilli certainly recognisable as those of black-quarter were present. Taking advantage of the fact that the latter is very resistant to heat, some fluid expressed from the diseased tissues had its temperature raised to 70° C., with the object of killing as many as possible of the accidentally present putrefactive organisms. A few drops of the liquid were then used to inoculate two guinea-pigs, and the remainder was injected into the thigh of a full-grown sheep. Both guinea-pigs died within 48 hours, and *post-mortem* examination of them showed at the seat of inoculation in the muscles of the thigh a typical black-quarter lesion, with black-quarter bacilli present in it in large numbers, and apparently in a state of purity. The sheep was killed on the third day, when evidently at the point of death. The inoculated leg was greatly swollen, and partly emphysematous, and on dissection it had the sour odour and the other distinguishing characters of a black-

quarter tumour. Moreover, microscopic examination of it showed great numbers of black-quarter bacilli apparently unassociated with any other organism.

Before leaving the farm directions were given that when the next few deaths occurred among the sheep the dead animal was to be skinned immediately, and from any part of the body that appeared discoloured or swollen a piece was to be cut out, wrapped in a cloth soaked in a disinfectant solution, and forwarded to the laboratory by post. In this way it was ascertained that two of the three succeeding deaths among the sheep on this farm were caused by black-quarter.

It is of interest to note that at this time no young cattle were kept on the farm, but in previous years several calves had died from black-quarter. It is also important to mention that adult sheep as well as lambs shared in the heavy mortality on the farm, and in several other cases of black-quarter in sheep that have come under notice, it was evident that in the ovine species no immunity against the disease was conferred by age, although, as is well known, cattle over two years of age are rarely attacked.

In a case of black-quarter among cattle reported to the laboratory in the month of October last, the circumstances were of an unusual character. Out of a lot of 70 yearlings no fewer than 19 were attacked in the course of a few days. The disease first showed itself on the third day after the animals had been removed from one farm to another, and 12 of them were almost simultaneously attacked with crackling swellings in one or other limb. The other seven were seized within the following three days. Although the cattle had been moved from one farm to another no change had been made in their other food (cake and rice meal). It was ascertained that a few weeks prior to the outbreak one of the cattle in the same field had died from some undiscovered cause, and after having been skinned, the carcass was left in the field, where it was partly devoured by pigs without any ill-effect. At the time when the 70 yearlings were put into this field the carcass was in large measure shrivelled up, but it had been noticed that the yearlings congregated around it, and nibbled and licked the dried bones. By request portions of the carcase were sent to the laboratory, but the experiments made failed to show whether it contained black-quarter germs or not, as all the inoculated animals died from putrid infection.

It has already been mentioned that one can with great certainty infect a susceptible animal with black-quarter by injecting into its muscles or under its skin material containing the bacilli. The fresh liquid from the swollen leg in a natural case of black-quarter will convey the disease in this way, and the muscular tissue of the diseased part retains all its virulence when it is dried at a moderate temperature. But such dried and virulent muscular tissue may have all its contained bacilli and spores destroyed by exposure to a high temperature. Such temperature, however, requires to be considerably over the boiling point in order to immediately and completely sterilise the muscle. Short of the point at which

complete sterilisation is effected the germs are either so enfeebled or so reduced in numbers that a moderate quantity of the muscular tissue may be injected under the skin of a susceptible animal without causing death or serious illness. This fact forms the basis of a method of protective inoculation which was introduced by M. Arloing of the Lyons Veterinary College, and which has within recent years been practised on a very large scale in France, Switzerland, and Austria. The dried and powdered muscle is exposed for five or six hours to a high temperature, and a small quantity of the "vaccin" thus prepared is injected under the skin near the tip of the tail. Experiments have conclusively proved that an animal can be protected by this method, and it is said to have greatly reduced the mortality from black-quarter where it has been resorted to in the countries mentioned. It is, however, attended with one rather serious drawback, viz., that in spite of every possible care in the preparation of the vaccin it is of somewhat uncertain strength. Consequently, it occasionally determines the death of a few of the inoculated animals, and in other cases it is probably so weak that no protection is conferred by the operation.

During the past year, after the risks incidental to the operation had been fully explained to the owners, vaccin prepared according to Arloing's method in the Research Laboratory was supplied (free of charge), and used to vaccinate several lots of young cattle on farms where black-quarter was prevalent to a serious degree. The vaccination was carried out by the local veterinary surgeons, and in no case was it followed by any accident, nor has any death from black-quarter been since reported in any of the vaccinated animals. It ought to be stated that the owners of the animals had been led by previous experience of setoning to believe that no protection was conferred by that operation.

Strangles.

The disease of horses which is well known to most horse-owners under the name of strangles is a febrile complaint in which an abscess or abscesses form in the lymphatic glands between the jaws or in the region of the throat, and occasionally in some of the internal organs or in other parts of the body. The cause of the disease is a minute germ or bacterium termed a streptococcus, which in the early stages of the disease multiplies in or on the lining membrane of the nose. When the organism penetrates into that membrane it is apt to be carried in the lymph stream to one or other of the above-mentioned lymphatic glands, and being arrested there it begins to multiply and manufacture irritant matters, and thus determines the formation of an abscess. The development of the abscess is often accompanied by soreness of the throat, with consequent difficulty in swallowing, and absorption of poisonous products from the abscess into the system excites a condition of fever and constitutional disturbance, which, combined with the loss of appetite and difficulty of swallowing, generally lead to considerable

loss of condition. The great majority of cases of uncomplicated strangles terminate in recovery, and entail nothing more serious than temporary loss of condition, and the financial loss represented by the sick animal's enforced idleness, but in a not inconsiderable number of cases death results from the severity of the fever, the bursting of the abscess into the air-passages, the formation of abscesses in the brain or some of the internal organs, or the onset of an attack of pneumonia.

But observations which have been made in the Research Laboratory during recent years indicate that the strangles streptococcus is responsible for a good deal more mischief than it has hitherto been credited with, for by ordinary bacteriological methods this organism, or one not distinguishable from it by morphological or cultural characters, has been found present in a large proportion of cases of fatal pleurisy in the horse, and in febrile "colds" not usually diagnosed as strangles owing to the absence of an abscess about the throat or elsewhere.

It is a matter of general experience in the large studs in London and other cities that the great majority of horses when first introduced into the stables within a week or two develop a more or less serious attack of catarrhal fever, and microscopic examination in a series of such cases has shown that the strangles streptococcus, or an organism morphologically identical with it, is present in the discharge from the nose. There are therefore grounds for believing that very many cases of strangles are never diagnosed as such, but are set down as febrile colds due to some unknown cause.

There is sufficient experience to justify the statement that strangles is not communicable to the human subject, and in that respect it is a less important disease than glanders, but it is probable that at the present time the streptococcus of strangles is a greater source of loss to horse-owners than the glanders bacillus, and improvements in the methods of preventing or treating the diseases which it determines are therefore well worth seeking after.

Although some veterinary surgeons still hold the contrary opinion, it is hardly open to doubt that strangles is always due to contagion, that is to say, the transmission of the specific streptococcus from diseased to healthy horses. It is of course open to anyone to deny this, although admitting that the streptococcus is the actual cause of the disease; for it is conceivable that, like the organisms which are commonly the cause of suppuration in human beings, the strangles streptococcus might be capable of growing outside the body, and be found growing in various places quite unconnected with any previous case of strangles in the locality. There is, however, no proof of the existence of the strangles organism in places in which cases of the disease have never occurred, and the history of strangles in country districts is all in favour of the view that the disease never crops up sporadically, but is always due to contagion.

During the past year two horses have been experimented upon with the object of obtaining from them a serum that might be of value in the treatment or prevention of strangles and other diseased

conditions, such as pleurisy, caused by the same organism. At the outset of these experiments the animals were repeatedly injected subcutaneously with filtered cultures of the strangles organism, and after some months they were tested by subcutaneous injection of moderate quantities of virulent unfiltered cultures. The effect was disappointing, for it was found that no protection had been conferred, or at least not sufficient to prevent the development of an abscess at the point of inoculation. The employment of filtered cultures was then abandoned, and living unfiltered cultures were repeatedly, and in increasing quantities, injected under the skin. As a rule suppuration followed at the seat of inoculation, but the abscess was small, and there was no constitutional disturbance associated with its development. After some months of this treatment, the dead but unfiltered cultures were injected directly into the veins, and finally quantities of unfiltered living cultures up to 200° C. at one time have been injected in the same way without producing any serious effect. It is therefore evident that a high degree of immunity against strangles has been conferred on these horses, and arrangements have been made to test the protective and curative effect of their blood serum on animals exposed to the contagion of strangles, or actually suffering from that disease. The result of these trials will be communicated in a future report.

The Dangers of Mangel-feeding for Male Sheep.

During the past year, at the request of the Veterinary Committee, some experiments were carried out with the object of discovering an explanation of the formation of crystalline deposits in the urethra of rams or wedders fed on mangels. The subject was brought under the notice of the Veterinary Committee by Sir John Thorold, who had the following unfortunate experience of the dangerous effects of mangel-feeding among his rams. A lot of 80 rams on grass land, and just off swedes, were given first a mixture of swedes and Golden Tankard mangels, and then mangels only, with the usual allowance of dry food and an abundant supply of pure water. In less than a month several sheep were amiss, and five of them died or had to be killed. In each case the urethra was crowded with angular crystals of a pinkish colour, which on exposure to the air turned white. Dr. Voelcker found that these crystals consisted mainly of phosphate of magnesia and ammonia, with some phosphate of lime, and a little carbonate of lime. Female sheep of the same age, which had the same mangels *ad libitum*, suffered no ill effects.

It was thought possible that an explanation of the formation of the crystals might be found in some pronounced difference between mangels and swedes in respect of the amount of mineral constituents present in them, but that was not borne out by a chemical analysis carried out by Dr. Voelcker, who found the composition of the two classes of roots to be as follows :—

—	Dry matter	Total ash constituents	Phosphoric acid	Magnesia	Potash
	per cent.	per cent.	per cent	per cent.	per cent.
Mangels	12 50	1·0	·07	·03	·10
Swedes	11 00	·6	·06	·02	·22

Attention was accordingly turned in the next place to the chemical composition of the urine passed by sheep during a mangel diet. At the Royal Veterinary College seven sheep (five wedders, one ram, and one ewe) were obtained for experiment, and from one of them (the ram) the urine passed during 24 hours while being fed on bran and hay was collected and forwarded to Dr. Voelcker for analysis. The whole of the sheep were then placed on a pure mangel diet, and samples of urine were afterwards collected from the ram, the first being taken on the fifth and the second on the fourteenth day after the mangel-feeding was begun. Within a day or two after the change of food even the attendant noticed that all the sheep were passing much more urine than before. The quantity passed by the ram on the fourteenth day (24 hours) amounted to 4·78 litres, or over four times the quantity which had been secreted by the same animal on a diet of hay and bran. The results of Dr. Voelcker's analysis are shown below :—

Analyses of Urine from Ram.

	1 Hay and Bran diet July 21, 1897, 24 hours	2 Mangel diet July 26, 1897, 24 hours	3 Mangel diet August 4–5, '97, 24 hours
Water	93·66	98·54	97·64
*† Organic matter and ammoniacal salts	1 48	·14	·88
Lime	·06	·01	·002
Magnesia	trace	trace	·007
Phosphoric acid	·22	·04	·025
Sulphuric acid	·18	·02	·013
Sodium chloride	·84	·24	·33
Other alkaline salts, etc. . . .	·56	·71	1 103
	100·00	100 00	100 000
* Containing nitrogen	1·12	·22	·35
† " urea	1·79	·35	—
Specific gravity	1·029	1·011	1·017
Reaction	slightly acid	very alkaline	very alkaline

Dr. Voelcker, in a note appended to the analysis, points out that the remarkable points are, "(1) the very much more dilute state of the mangel urine, (2) its marked alkalinity, and (3) the larger proportion of alkaline salts (mostly potash) other than common

salt which it contains, as compared with the urine passed on hay and bran."

With reference to the markedly alkaline reaction of the urine secreted on mangels, it ought to be stated that this was noted to be present in the freshly voided samples, and was not the result of subsequent fermentative changes. Sugar was not present in any of the three samples, and, as regards albumin, there was none in the mangel urine and only a slight trace in the hay and bran urine.

It may now be asked whether the above analysis throws any light on the formation of the urethral crystals. These crystals, as previously mentioned, are mainly composed of the double phosphate of magnesia and ammonia, which salt is not a normal constituent of urine, but is very constantly formed in that fluid when it undergoes fermentative changes, whether outside the body or in the bladder, in consequence of the growth of bacteria in the urine. It is therefore hardly open to doubt that these urethral salts result from the fermentation of urine, at first towards the orifice of the tube and subsequently further backwards, and it is not improbable that the marked alkalinity of the urine passed on a mangel diet predisposes to such fermentation owing to that reaction being more favourable than an acid one for the growth of the bacteria responsible for the decomposition of the urine.

The escape of female sheep from this accident of mangel-feeding admits of easy explanation, that escape being obviously due to the fact that the female urethra is short and wide and unfavourable for the formation of such mineral deposits owing to its being frequently "flushed" with a large stream of urine. In the male sheep, on the other hand, the terminal part of the urethra traverses the slender vermiform process at the end of the penis, and owing to the narrowness of the canal it is easily blocked.

The seven experimental sheep were kept on mangels for over five weeks, but urethral concretions did not form in any of them. This, of course, is not opposed to the conclusion that feeding on mangels is the common cause of these formations, for in general only a small proportion of a flock are so affected.[1]

J. McFADYEAN.

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[1] A portion of the mangels used in these experiments was kindly supplied by Lord Moreton, and the remainder was forwarded from the Woburn Experimental Farm.

JOINT REPORT BY THE CONSULTING BOTANIST AND THE CONSULTING CHEMIST ON THE GRASS EXPERIMENTS CONDUCTED BY THE SOCIETY, 1895–7.

In response to suggestions made at several of the General Meetings of Members of the Society, and by individual Members in correspondence, the Council, early in 1895, decided to institute an inquiry into the means to be recommended for adoption with a view to the improvement of grass land throughout the country. The Chemical and Botanical Committees jointly drew up a Scheme of Experiments to be carried out on grass land in different parts of England, and this received the assent of the Council on April 3, 1895.

It will be desirable here to give a brief outline of the general line which it was decided the inquiry should take.

In the first place it was felt impossible, in view of the great diversities both of land and of systems of management pursued, to formulate one uniform experiment to be carried out simultaneously at all the selected sites. It was therefore resolved to select sites which should in their nature and surroundings be, as far as possible, typical of considerable tracts of land in their neighbourhood and of the system of grass-farming pursued in those districts. Further, that each case should be taken by itself, and those methods of treatment be pursued which, after botanical inspection of the pasture, chemical examination of the soil, and consideration of the surroundings, commended themselves to the scientific and the practical man alike as being worthy of trial.

Secondly, it was decided to limit the inquiry to—

1. The laying down of *new* pasture.
2. The improvement of existing *poor* pasture (*i.e.* of grass land that clearly stood *in need of* improvement) and which was intended to be kept as *permanent pasture.*

In regard to (1), it was felt that if fields were laid down with known mixtures of seed of approved germinating power and at known cost, and if these were kept under observation, much might be gained for guidance in the future.

As to (2), it was thought that, according to the respective circumstances, attempts at improvement might take the form of—

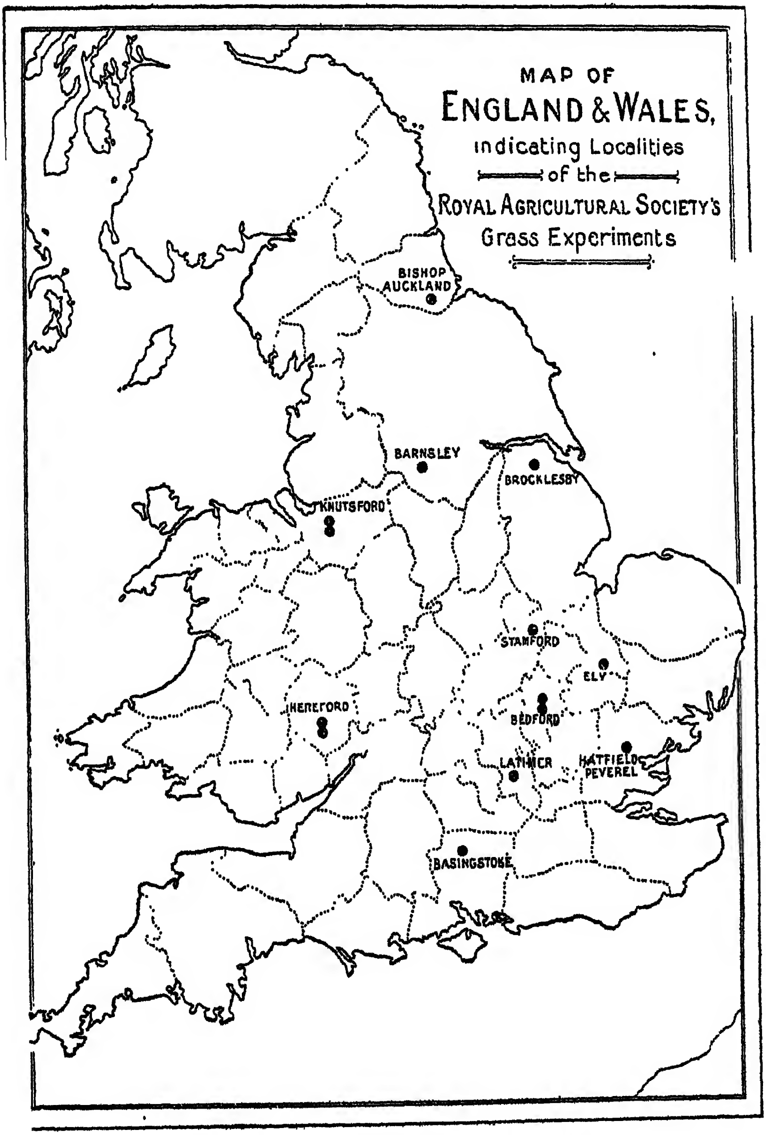
(*a*) Renovation of pasture.
(*b*) Manurial treatment of pasture.

As distinguished from the plan that has generally been adopted in the conduct of experiments on grass land, it was decided that, with a view to making these practically useful to the farmer, they should not consist of certain small areas set aside and railed off from the rest of a field, but of areas of about one acre each out of the selected field, the field being dealt with as a whole by the farmer, according to the ordinary course which he would in his farming

TABLE I.—*Grass Experiments.*

No.	County	Locality and farm	Field	Owner or occupier	Geological formation	Class of experiment
1	Bedfordshire	Willington, Hill Farm	—	Duke of Bedford (per Mr. C. P. Hall)	Oxford clay	Laying down pasture
2	„	Ampthill, Beckerings Park	—	„	Lower greensand	„ „
3	Essex	Hatfield Peverel, Fal... ... l	—	Lord Rayleigh (per Hon. E. G. Strutt)	London clay	„ „
4	Cheshire	Tatton Park	Park	Earl Egerton of Tatton (per Mr. J. T. Smith)	New red sandstone	Manurial and renovation
5	„	Knutsford, Tabley	"Smoker Field"	Mr. Alfred Ashworth	„ „	„ „
6	Lincolnshire	Brocklesby, Limber	"Mill Plats"	Mr. William Frankish	Chalk	„ „
7	Northamptonshire	Stamford, Laxton	"Willow Field"	Mr. James Hornsby	Lias	„ „
8	„	„ „	Park	„ „	„	Manurial
9	Bucks	Latimer, Home Farm	Broadfield, No. 2,033A	Lord Chesham (per Mr. G. H. Sanday)	Loam on chalk	„
10	„	„ „	No. 2,058	Lord Chesham (per Mr. G. H. Sanday)	„ „	„
11	Hants	Basingstoke, Woodgarston	—	Sir E. Bates (per Mr. W. B. Canning)	Clay loam on chalk	„
12	Durham	Bishop Auckland, Binchester Whins	"Bell Hills"	Messrs. Bolckow, Vaughan & Co. (per Mr. H. G. Burkitt)	Coal measures	„
13	„	Bishop Auckland, Binchester Whins	"Sheep Pasture"	Messrs. Bolckow, Vaughan & Co. (per Mr. H. G. Burkitt)	„ „	„
14	„	Bishop Auckland, Binchester Whins	"Wilkinson's Land"	Messrs. Bolckow, Vaughan & Co. (per Mr. H. G. Burkitt)	„ „	Manurial and renovation
15	Yorkshire	Barnsley, New Hall	"Low Ing"	Mr. C. Howard Taylor	„ „	„ „
16	„	„ „	"Long Ing"	„ „	„ „	„ „
17	„	„ „	"Castle Field"	„ „	„ „	„ „
18	Herefordshire	Hereford, Morton Jeffries	—	Mr. Leake (per Technical Education Committee, Hereford County Council)	Old red sandstone	„ „
19	„	Hereford, Bodenham, England's Gate	Field No. 10	Mr. J. H. Arkwright	„ „	„
20	„	Hereford, Bodenham, England's Gate	„ No. 13	„ „	„ „	Manurial
21	Cambridgeshire	Ely, Wilburton, Crow's Farm	—	Mr. Albert Pell	Gault	Manurial and renovation
22	Essex	Hatfield Peverel, Fairstead	—	Lord Rayleigh (per Hon. E. G. Strutt)	London clay	Manurial

system pursue. Instead of the improvement being judged by the mere increase of weight of hay produced on separate plots, the



experimental plots would be subject to the same treatment as the rest of the field, whether of grazing or of mowing. In short, the

idea was, to interfere as little as possible with the ordinary farming of the tenant, but to merely treat certain areas in a way which, if it seemed to be successful, might be profitably adopted by the farmer while pursuing the ordinary routine of his farming practice.

With this object in view, it was decided not to deal so much with theoretical considerations as to what particular chemical constituents were required on particular lands, and in what combinations they might best be applied, but, in the case of manurial applications, to have regard to those materials which, from a chemical examination of the soils, seemed likely to meet the deficiencies of the soil, and, at the same time, to be such that the practical farmer might readily avail himself of their use. So also with seeds added to bare or foul pastures; while having respect to the defects in the field, special attention was paid to the introduction of good perennial grasses which could be sown at a small cost per acre.

These general principles having been settled, the Chemical Committee (to whom the work was henceforth entrusted) proceeded, with the aid of different Members of Council, and the Consulting Botanist and Consulting Chemist, to inspect sites which had been kindly offered in different parts of the country by individual Members willing to co-operate in the work of inquiry. To those thus offering land for the purpose the thanks of the Council are heartily given. From these different sites a certain number which were considered as being suitable for experimental purposes were selected. After being approved by the Chemical Committee, reports on the Botanical and Chemical aspects and requirements were prepared by the Consulting Officers of the Society and a plan for the experimental treatment drawn up.

In the first instance the schemes of experimenting at nine sites in six different parts of the country were, on November 5, 1895, approved, after these sites had been duly inspected, reported on, and the herbage and soil analysed. In December 1895 ten more sites in four different districts were added, after similar inquiry, and at a still later date (December 1896) three others followed, bringing the total up to 22 experimental sites in twelve different parts of the country. Table I., p. 138, gives the distribution and other particulars as to the sites, and the map on p. 139 shows the position of the latter.

It will be seen that eleven different counties and nine different geological formations were embraced in the foregoing plan. At three sites the experiments took the form of the laying down of new pasture, and, at the remainder, of improvement by manurial means, with, in eleven cases, renovation by re-seeding as well.

Wherever seeds were applied for renovation purposes or for laying down new pasture, these were selected and tested beforehand by the Consulting Botanist, and, to secure uniformity, all artificial manures applied were ordered from one centre, and analysed by the Consulting Chemist previous to application. In the case of lime and similar materials which would in practice have to be obtained locally, the experimenters procured these, submitting samples first

to the Consulting Chemist. The cost of the seeds for renovating, and of the manures applied, was borne by the Society, while that of marking out the ground, and of other operations incidental to the experiments, was met by those undertaking to conduct them. Visits of inspection have, as required, been paid by the Consulting Botanist and Consulting Chemist, and interim reports been presented from time to time to the Chemical Committee.

The year 1896, marked as it was by considerable dryness, was a very unfavourable one for anything to tell as the result of the different applications of manure and of the methods of treatment. In many cases the new seeds put on that year almost entirely failed to germinate in consequence of the drought, and it is very certain too that frequently the manures did not act as they would have done had there been more rain to wash them in and make them available. As a consequence, the observations made in 1896 were not such as to lead to any very definite conclusions or anticipations, but in 1897 the circumstances were more favourable, and it is perhaps allowable now to gather together the general results so far as it is possible to frame them. Each experimental site will now be dealt with in detail.

A. Laying down Land to Pasture.

County	Locality and farm	Formation
1. Bedfordshire	Willington, Hill Farm, near Bedford	Oxford clay

On this farm, visited April 27, 1895, there were two fields, comprising, in all, 69 acres of cold, heavy (4-horse), clay land, which were to be laid down to permanent pasture. The experience in this part of the country has been that, even when as much as 10*l.* per acre has been spent on cleaning the land thoroughly and laying it down, the grass has done fairly for three to four years, and then has "gone off," the land, after ten or eleven years, not being worth 5*s.* an acre, though 30*s.* an acre was originally spent in the seeding.

The land no longer "paying" for corn-growing, it was desirable to lay it down again in grass, but it was necessary not to go to so much preliminary expense as before in cleaning.

At Mr. Carruthers's suggestion the fields were sown at the beginning of May 1895 with the following mixture:—

Seeds per acre			Number of germinating seeds	Cost *s.*	*d.*
5 lb.	*Phleum pratense*,	containing	6,427,000	2	3¼
2 „	*Poa trivialis*	„	4,043,000	2	6
7 „	*Dactylis glomerata*	„	2,684,000	5	10
6 „	*Festuca pratensis*	„	1,346,000	3	9
2 „	*Alopecurus pratensis*	„	686,000	2	2
3 „	*Trifolium repens*	„	2,152,000	3	3
¼ „	*Achillea Millefolium*	„	790,000	0	10
Total number of germinating seeds per acre			18,128,000	Total cost per acre £1 0	7¼

The seeds were sown in an oat crop in May, 1895, but the dry weather that followed prevented their proper germination at the time.

In October 1897 Mr. Carruthers reported :—

"All the seeds have germinated, though the ground is not completely covered with plants. The grasses were growing vigorously, but the yarrow was a very poor plant. The fields were being fed off. One field had been treated with basic slag. I could see no difference from the use of this manure. In the upper field a crop of alsike and ryegrass was taken in 1893, a crop of wheat in 1894, and the seeds were sown with oats in 1895. Seeds of alsike and rye-grass lying dormant in the soil since 1893 had germinated, and these plants were present in considerable quantity in the field."

County	Locality and farm	Formation
2. Bedfordshire	Ampthill, Beckerings Park	Lower greensand

Here the soil is a totally different one from that in the neighbourhood of Bedford (No. 1), being a light blowing sand, very thin, and bringing up sandstone and ironstone freely when ploughed. Some of the land was so bad that it was decided not to attempt to lay it down, but to keep it as a rabbit warren. On the remainder, comprising three fields (Nos. 296, 297, and 322) 75 acres in all, Mr. Carruthers recommended the use of the following seed mixture :—

Seeds per acre			Number of germinating seeds	Cost s.	d.
4 lb.	*Phleum pratense,*	containing	5,142,000	1	10
2 „	*Poa trivialis*	„	4,043,000	2	6
2 „	*Poa pratensis*	„	2,976,000	1	6
7 „	*Dactylis glomerata*	„	2,684,000	5	10
4 „	*Festuca pratensis*	„	897,000	2	6
3 „	*Trifolium repens*	„	2,152,000	3	3
2 „	*Medicago sativa*	„	439,000	1	8
¼ „	*Achillea Millefolium*	„	790,000	0	10
Total number of germinating seeds per acre			19,123,000	Total cost per acre 19	11

The seeds were sown in a corn crop in the spring of 1895, and in October 1897 Mr. Carruthers reported :—

"Fields 296 and 297. The seeds were hayed in 1897, and produced a good crop in which the various grasses sown were present. The hay was very clean and free from weeds except thistles, which were too abundant. The ground was well and evenly covered with herbage."

"Comparison of the seeds sown with the produce of the hay in 1897 :—

	Number of germinating seeds sown	Bulk of plants in the hay: Field 296	Bulk of plants in the hay: Lower part of Field 297
Phleum pratense	5,142,000	10	10
Poa trivialis } *Poa pratensis* }	7,019,000	20	2
Dactylis glomerata	2,684,000	8	35
Festuca pratensis	897,000	-	5
Trifolium repens	2,152,000	25	25
Medicago sativa	439,000	3	½
Achillea Millefolium	790,000	2	4

"The following plants were also found in the hay :—

Agrostis vulgaris	25	15
Bromus mollis	½	-
Lolium perenne	—	2
Thistle	3	1
Sorrel	2	—
Mouse-ear chickweed	½	½
Hawk's-beard	1	—

"Field 322 was also sown down in 1895 with a barley crop. It was being fed off with stock. The herbage was rather bare on the tops of the knolls in the upper part of the field ; cock's-foot and yarrow were the only plants that maintained their hold in these places. All the grasses, clover and yarrow, were abundant in the lower and moister parts of the field."

County	Locality and farm	Formation
3. Essex	Hatfield Peverel, Fairstead	London clay

On this farm of Lord Rayleigh's there was, on April 1, 1897, a 10-acre field of rather heavy clay loam, with brown clay subsoil, which was being prepared for laying down to grass. It was being mole-ploughed, and a corn crop was to follow, among which the grass seeds were to be sown. At Mr. Carruthers's suggestion the following mixture was used per acre :—

Seeds per acre		Number of germinating seeds	Cost s.	Cost d.
5 lb.	*Phleum pratense*, containing	6,468,000	2	1
2 ,,	*Poa trivialis* ,,	4,380,000	2	1
6 ,,	*Dactylis glomerata* ,,	2,428,000	5	6
5 ,,	*Festuca pratensis* ,,	1,133,000	2	11
2 ,,	*Alopecurus pratensis* ,,	833,000	3	4
3 ,,	*Trifolium repens* ,,	2,152,000	3	0
½ ,,	*Achillea Millefolium* ,,	1,492,000	1	10
	Total number of germinating seeds per acre	18,886,000	Total cost per acre £1 1	0

The seeds were sown early in April 1897, and at the present time they appear to have taken satisfactorily.

It is hoped that by laying down fields such as the foregoing with known amounts and kinds of seeds of approved quality, and

keeping them under observation, information may be gained as to the permanence and suitability of the seeds employed for the respective classes of soil.

B. Improvement of Poor Pasture.

County	Locality and farm	Formation
4. Cheshire	Tatton Park	New red sandstone

Earl Egerton of Tatton had, for several years (1891–4) previous to the inception of these experiments, given up a portion of his park for the conduct of grass experiments by the Royal Manchester, Liverpool, and North Lancashire Society. The records of these appear in the Journals of that Society, but the experiments have been discontinued since 1894, though the spots where they were conducted show still very markedly the results of the various treatments employed. Lime, bones, and basic slag in particular seemed to produce benefit to the herbage, and, accordingly, in planning out the new series, attention was particularly directed to the use of these materials. It may also be said that it has been found, as a matter of farming practice over the park, that liming followed by the grazing of cattle has been, if expensive, the best way of transforming the rejected herbage into palatable pasture.

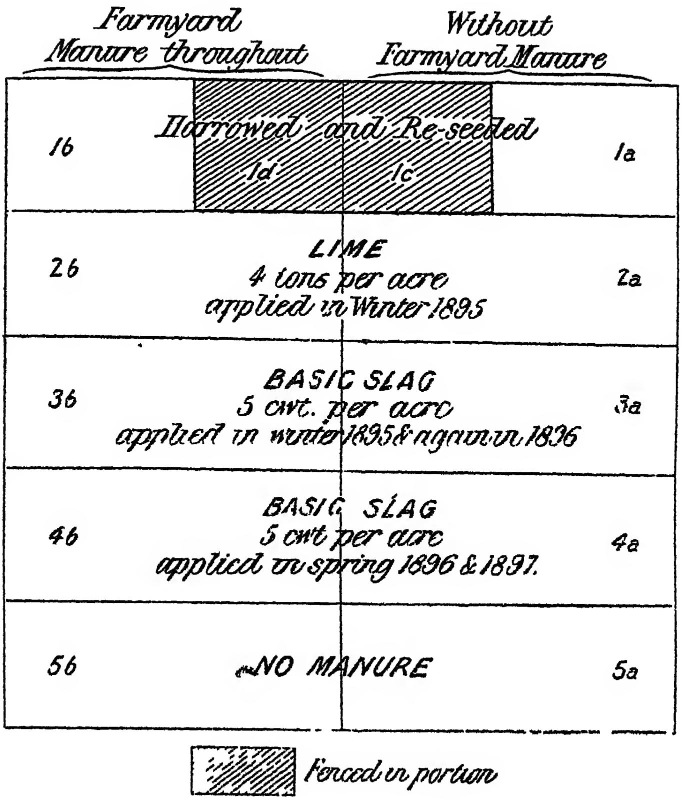
Mr. Carruthers, on visiting the proposed site in 1895, reported thus :—

"The pasture consists mainly of common bent grass or twitch (*Agrostis vulgaris*), any other grass only here and there being able to hold its own against it. Where lime has been applied there has been no alteration in the kind of grass, but its quality has been improved, the twitch being greener and more vigorous than elsewhere, and evidently preferred by the stock."

Where liming had not been done field rush (*Luzula campestris*) was very noticeable, and, on cutting down to the turf, a spongy mass of stems of twitch was to be seen. Where lime had been applied, followed by grazing, this matting was much reduced and the roots penetrated much more freely into the soil.

A suitably situated area of 5 acres was selected. This had been limed some eleven or twelve years previously and since grazed every year. It was intended that grazing should be continued as before. In consequence of the quantity of twitch and the matting together of the wiry stems of this above the surface of the ground, it was decided to attempt the removal of part of it, by harrowing and cross-harrowing, and then to sow good seed upon the land, subsequently bush-harrowing to get the seeds into the soil.

As regards manurial treatment, it was proposed to try: (1) lime at the rate of four tons per acre; (2) basic slag, winter application; (3) basic slag, spring application, and (4) farmyard manure. The plan adopted was as follows :—



Area, 5 acres—5 plots of 1 acre each.

Particulars of Treatment.

Lime applied (Plot 2). Dec. 1895. 4 tons per acre. Buxton lime, cost 12s. per ton delivered.

Basic Slag applied (Plot 3). 5 cwt. per acre, Dec. 1895, and again (5 cwt.) Oct. 1896. Cost 30s. per ton delivered (31 per cent. phosphates, 81 per cent. fineness).

" " (Plot 4). 5 cwt. per acre. March 1896, and again (5 cwt.) March 1897.

Farmyard Manure (over one half the whole area). Applied Jan. 1896.

Harrowing and re-seeding [1] (Plot 1). Done April 1896. Re-seeding repeated Sept. 16, 1896.

As it was feared that damage might be done on Plot 1 by stock, rabbits, &c., when the newly sown grass began to come up, a portion

[1] For particulars of re-seeding, see footnote, p. 148.

of this (shaded in the plan) was fenced off. The harrowing of Plot 1 was found to be a most troublesome business, owing to the matting together of the stems of the twitch. No less than 50 loads of rubbish were taken off the single acre Plot 1, and the cost of harrowing was 5*l*. This must make such method of treatment quite prohibitive. At the same time, in other experiments, to be described later, the harrowing has not cost over 10*s*. an acre. Of course in these other cases the work of harrowing was not as thoroughly done as here, but sufficiently to effect a marked improvement. The drought of 1896 prevented the newly sown grass seeds from germinating fully, and they were accordingly re-sown in September 1896. Visiting the experiments at that time it was noticed that where re-seeding had been done clover and yarrow seemed to have come fairly, but not the grasses. The most singular feature, however, was that on the fenced-in portion the herbage was not as good as where sheep had been allowed to graze. Also, on the enclosed part, where farmyard manure had been used, the only effect of the latter seemed to be to increase the growth of Yorkshire fog.

It would appear as if the treading by the sheep had done more good than the fencing-off of the newly sown pasture.

As regards the other plots, the dunged halves had produced more growth of grass, but the undunged ones were more closely eaten. The result from lime (Plot 2) was better than from basic slag (Plots 3 and 4), but the latter exhibited improvement also; the spring application seemed to be nearly as effectual as the winter one. Plot 5*b*, where farmyard manure alone had gone, showed a clear improvement over the undunged half (5*a*), but it was not as good as where basic slag had been used.

The spreading of the farmyard manure, doubtless, kept the stock off the land to some extent.

Re-seeding, as stated, was done on September 16, 1896, the applications of basic slag were repeated in October 1896 (Plot 3), and in March 1897 (Plot 4), and, on inspecting the site in the autumn of 1897, it was clear that Plot 1 (re-seeded) had been extremely well-eaten down by stock. The dunged portion was not so closely grazed, but was a great improvement on the original pasture outside. The fencing of the Plots 1*c* and 1*d* had, by now, been removed, and these plots were thrown in with the rest. They did not exhibit marked differences. The limed plots (2*a* and 2*b*) were distinctly the best of all, exhibiting a freshness and greenness not noticeable in the other plots. Basic slag, whether applied in winter (Plot 3) or in spring (Plot 4), had also clearly effected improvement, but not one equal to that of the lime. There was little to choose between the spring and winter applications of basic slag.

Farmyard manure alone (Plot 5*b*) showed a most marked difference from 5*a* and the untreated parts of the park. Where farmyard manure had previously crossed the applications of lime and basic slag, the result in this second year was distinctly favourable, these plots being decidedly the better eaten down, and showing far fewer rough tufts of grass upon them.

At the present stage of the experiments it would appear:

1. That liming has clearly sweetened the pasture, and, when followed by the application of farmyard manure, has produced the best result.

2. That basic slag has, so far, given the next best result, and that it is not very material whether it be applied in autumn or in spring.

3. That farmyard manure increases the growth of herbage in the first year, but tends to keep stock off; in the second year, however, the result is a more closely eaten herbage.

4. That harrowing the old rough grass and re-seeding (if this can be done at a moderate cost) will produce a herbage which will be much relished, and that exclusion of stock from it, even in the early stages, is not necessary.

Mr. Carruthers observes particularly that the change produced in the appearance of the herbage by the use of lime, basic slag, &c., is not one in the *kind* of grass, but rather in the sweetening and improving of it.

This experimental site bids fair to be a very useful one, the difference between the portion of the park experimented on and that not under experiment being most clearly marked, even from some distance off, the green look of the re-seeded, limed, and basic slag plots being very striking.

County	Locality and farm	Formation
5. Cheshire	Knutsford, Tabley	New red sandstone

The selected field is one on Mr. Alfred Ashworth's farm, and is called "Smoker Field." In this part of the country it is the custom, in the case of grass land, to run dairy cows over it, to plough the grass up as soon as it shows signs of failing, to take a crop of oats off, then potatoes for 2 years, and, after that, to lay down with seeds in an oat crop. Lime, where applied, has seemed to benefit pastures, but bones have done little good. Basic slag, of late years, has also been tried.

An area of two acres was taken in this field, and divided as follows:—

	Harrowed and		re-seeded portion	
Farmyard manure throughout.	4*c*	3*c*	2*c*	1*c*
	4*b*	3*b*	2*b*	1*b*
Without farmyard manure.	4*a*	3*a*	2*a*	1*a*
	4 tons lime per acre throughout	8 cwt. basic slag per acre throughout	5 cwt. boiled bones per acre throughout	No manure

The herbage was found to be almost entirely twitch or common bent grass, forming, as in the case of Tatton Park (No. 4), a compact turf, with the wiry stems matted together into a spongy layer which hindered the growth of other plants. It was decided, as at Tatton Park, to attempt harrowing, cross-harrowing, and re-seeding. The harrowing in this instance, however, did not cost above 10*s.* per acre.

The soil, which was a light sandy loam of a reddish-brown colour, gave on analysis :—

(*Soil dried at 212° F*)

[1] Organic matter and loss on heating	4·50
Oxide of iron	1·36
Alumina	1·96
Lime	·17
Magnesia	·50
Potash	·20
Soda	·16
Phosphoric acid	·02
Sulphuric acid	·02
Insoluble silicates and sand	91·11
	100·00
[1] containing nitrogen	·15

The soil, it will be seen from the above, is very sandy and poor. It has very little vegetable matter for a grass field, is poor in nitrogen and potash, is very deficient in lime, and has an almost total absence of phosphoric acid.

The harrowing was done in January 1896, and, as soon as completed, the lime (Plots 4*a*, 4*b*, 4*c*), basic slag (Plots 3*a*, 3*b*, 3*c*), and boiled bones (Plot 2*a*, 2*b*, 2*c*) were put on. The farmyard manure went on two months later, and the re-seeding was done in April.[1] All the plots were more or less harrowed before the manures went on. The whole field was open to grazing during 1896. That autumn the lime and the basic slag seemed to show some improve-

[1] *Particulars of Re-seeding.*

Seeds per acre		Number of germinating seeds	Cost s. d.
3 lb.	*Dactylis glomerata*, containing	1,200,000	2 9
2 „	*Festuca pratensis* „	450,000	1 6
½ „	*Poa trivialis* „	1,000,000	0 7
1 „	*Phleum pratense* „	1,293,000	0 4½
2 „	*Trifolium repens* „	1,420,000	2 0
¼ „	*Achillea Millefolium* „	800,000	0 10
	Total number of germinating seeds per acre	6,163,000	Total cost per acre 8 0½

The same re-seeding was employed in all the other cases, except that on Castle Field, Barnsley (No. 17) an additional pound (making 4 pounds in all) of cock's-foot was sown, increasing the number of seeds to 6,563,000 and the cost per acre to 8*s.* 11½*d.*

ment, the lime plot in particular having the greenest look. The one best eaten was the basic-slag plot. The farmyard manure had not had time to work properly, and the influence of bones was not noticeable at all. A quantity of rough grass had been removed from the re-seeded plots, and burnt. At the end of another year (autumn 1897—no further manuring having been done meanwhile), the appearance of the whole of the plots was most unpromising, and, with the possible exception of the limed ones (4*a*, 4*b*, 4*c*), none of the treatments had, practically, produced any improvement. The re-seeded plots (1*c*, 2*c*, 3*c*, 4*c*) were little better than before, except where the old grass had been literally torn away and clovers and good grasses had taken their place. It seemed almost hopeless to attempt to get rid of the old grass, and cattle put into the field would not eat it, except perhaps on the lime and basic-slag plots. The lime produced a fresher and greener appearance, and stock came more on this part, but neither farmyard manure nor boiled bones had, so far, done any good.

Altogether, this experiment is the most unpromising one of the whole series, and the only chance seems to lie in the lime working in the course of time. At present the coarse grass hangs about like tufts of long hair, and it seems almost impossible to get rid of it.

No conclusion of a definite kind can as yet be drawn from this experiment, though lime would appear to be making the pasture sweeter.

County	Locality and farm	Formation
6. Lincolnshire	Brocklesby, Limber	Light loam on chalk

The selected field is a very large one, of 65 acres, called "Mill Plats," on the farm of Mr. William Frankish. The field is one that has always been grazed, but the herbage is very coarse, and the field, at commencement, would not keep two sheep to the acre. Little or nothing had been done in the way of manuring, and frequently the grass became so rough and coarse as to necessitate cutting it over.

An area of 5 acres was selected, and analysis of the soil gave:—

(*Soil dried at* 212° *F.*)

[1] Organic matter and loss on heating	4·81
Oxide of iron	2·18
Alumina	2·11
Lime	·17
Magnesia	·54
Potash	·25
Soda	·08
Phosphoric acid	·20
Sulphuric acid	·07
Insoluble silicates and sand	89·59
	100·00

[1] containing nitrogen . . . . ·16

The top soil is of very light character, with sub-soil of clay. Although resting on chalk, the soil has extremely little lime; it is deficient in vegetable matter and nitrogen, and has not much potash, but is fairly supplied with phosphoric acid. From the analysis *lime* would appear to be the great requisite.

Mr. Carruthers's report on the botanical features of the pasture was to the effect that the principal grass was twitch or bent grass, and the next most prominent Yorkshire fog. There was also a number of hassocks. The other grasses were hard fescue, dog's-tail, and meadow grass, but ribwort and other weeds were plentiful. Owing to the compact nature of the twitch, the same course of treatment (by harrowing and re-seeding) as advised at Tatton Park (No. 4) and Tabley (No. 5) was suggested, and the plan of experiment was as follows :—

	This half limed throughout with 4 tons lime per acre	Unlimed throughout	
1*b*.	Harrowed	and re-seeded	1*a*.
2*b*.	Mineral superphosphate, 4 cwt. per acre	Basic slag, 8 cwt. per acre	2*a*.
3*b*.	Mineral superphosphate, 3 cwt. Kainit, 3 cwt. } per acre	Basic slag, 6 cwt. Kainit, 3 cwt. } per acre	3*a*.
4*b*.	Bone 4 cwt.	meal per acre	4*a*.
5*b*.	Farmyard 12 loads	manure per acre	5*a*.

5 plots—1 acre each.

Mr. Frankish adopted in these experiments a very simple and good plan of separating the different plots, viz. by marking out the boundaries of each plot with a draining plough. This plan might with advantage be followed in the experiments of others.

The lime was put on in January 1896, and the limed half lightly harrowed over; the manures were applied early in February, the dung rather later. The harrowing of Plots 1*a* and 1*b* was also done early in February, the land being gone over six or seven times. The cost, however, was only 7*s*. to 8*s*. an acre. In this case the harrowing and re-seeding has been extremely successful, more especially where lime was applied. Already in the first year the rough tufts of grass seem to have disappeared, and by the second year a practically level sward was obtained.

The entire half that had been limed has shown marked improvement, whatever the cross dressings of manure have been, but the plots that stand out above all the others are Plots 1*a*, 1*b*, 5*a* and 5*b*, more particularly the limed ones, 1*b* and 5*b*. There is no question that farmyard manure has given the largest amount of keep, and that these and the re-seeded plots (1*a*, 1*b*) have been the closest

eaten.[1] These indeed, from their greenness and freshness, stand out quite apart from the rest of the field. It has been very noticeable that the stock all through the year have frequented the newly seeded and the dunged plots far more than the others, and that they have preferred the limed halves to the unlimed.

Basic slag used alone (2*a*) has produced more clover, but is hardly as good as mineral superphosphate with lime (2*b*), while the addition of kainit to either (3*a*, 3*b*) seems to have added no benefit. Bone meal (4*a*, 4*b*) has apparently, as yet, done no good.

The most striking features in this experiment are :—

1. The marked benefit resulting from harrowing the rough grass and re-seeding; the cost of harrowing in this case being quite moderate (7*s*. to 8*s*. an acre).

2. The great advantage obtained from the use of lime—a result foreshadowed by the chemical analysis of the soil.

3. The increased keep produced by farmyard manure, especially on land previously limed.

By way of supplementing this experiment, Mr. Frankish has dressed other spots in this field with lime up to 8 tons per acre, and the improvement is very clear.

County	Locality and farm	Formation
7. Northamptonshire	Stamford Laxton	Lias clay

"Willow Field" which had been 7 or 8 years in grass, but was not doing well, was selected for experiment, an area of 6 acres being taken. The grass had been mown nearly every year. The grasses did not cover the ground by any means completely, and had a starved and stunted appearance. Bent grass was the principal one, with Yorkshire fog, dog's-tail, and a little cock's-foot and brome grass. The top soil was very thin, followed by a heavy clay subsoil. Analysis gave :—

(*Soil dried at* 212° *F.*)

[1] Organic matter and loss on heating	7·30
Oxide of iron	4·08
Alumina	6·32
Lime	9·44
Magnesia	·60
Potash	·79
Soda	·17
Phosphoric acid	·15
Sulphuric acid	·09
Carbonic acid, &c.	8·26
Insoluble silicates and sand	61·81
	100·00
[1] containing nitrogen	·30

The difficulty with this soil is not so much in its chemical constituents, for it is well supplied with lime, potash, nitrogen, and

[1] For particulars of re-seeding, see footnote, p. 148.

vegetable matter, and has a fair proportion of phosphoric acid; but the trouble would seem to consist in the heavy impenetrable condition of the soil. This tells especially in a dry season. The area is set out thus :—

Farmyard manure, 12 loads per acre	Basic slag, 8 cwt. per acre	Road scrapings, 18 loads per acre	No manure
4	3	2	1

4 plots—$1\frac{1}{2}$ acre each.

It was originally intended to divide the area into two halves, renovating one half by re-seeding. In consequence of drought this has not been done. The manures were applied in January 1896.

In addition to the above, Mr. Hornsby sowed a strip running the whole length of each plot with salt at the rate of 5 cwt. per acre, but it showed not the least difference.

This entire experiment has been a disappointing one, so far as the influence of manures is concerned, and basic slag, which has been so often found useful on heavy land, has here made only a slight improvement. The pasture is practically as bad as it was at the first, and it would seem that other measures must be devised in the attempt to improve it.

County	Locality and farm	Formation
8. Northamptonshire	Stamford, Laxton Park	Lias clay

In Laxton Park another area was selected and treated as follows :—

Mineral super-phosphate, 4 cwt. per acre	Farmyard manure, 12 loads per acre	Gas lime, 2 tons per acre	Basic slag, 8 cwt. per acre
4	3	2	1

4 plots—1 acre each.

The herbage here was principally bent grass, with smaller quantities of Yorkshire fog, dog's-tail, sweet vernal, and large patches of brome grass. There was no clover. The manures were put on in January 1896.

In this experiment benefit has certainly resulted in all cases from the manuring, but the best plots, so far, are 1 (basic slag) and 2 (gas lime).

The basic slag has brought up a quantity of clover, none being visible before on the land. Gas lime has killed much of the rough grass, and this plot, on the whole, was eaten down closer by stock.

There is clover, but not as much as on Plot 1. Both the farmyard manure and the superphosphate plots remain rather rough, though showing improvement over the untreated pasture.

In addition to the experiments here set out, Mr. Hornsby has on his own account tried in different fields and in his park a number of others. So far as these have gone, the main conclusions are: (1) that by putting on gas lime thickly the coarse herbage is partly destroyed and a finer one comes up in its place; (2) that salt is inefficacious to produce the same result; (3) that bone meal, road scrapings with lime, as also soot, have, as yet, shown no benefit; (4) that basic slag, as also mineral superphosphate, answer fairly, the former more particularly encouraging the growth of clover.

No very decided result can as yet be drawn from the experiments here, beyond that: (1) gas lime may be usefully employed to kill rough grass and produce a sweeter herbage; (2) that basic slag may do good, and brings the clover up, and (3) that in the case of a hard, impenetrable surface that requires loosening and breaking up, manuring is, generally, of little use.

County	Locality and farm	Formation
9 and 10. Bucks	Latimer, Home Farm (10) Broadfield, No. 2,033*a* (11) Field, No. 2,058.	Loam on chalk

These sites are on Lord Chesham's Home Farm, Latimer.

Broadfield, No. 2,033*a*, has been down eighteen years in grass. The herbage is principally hard fescue and common bent grass; cock's-foot, yellow oat grass, rye grass, and quaking grass also occur. There is a fair bottom of white clover with some red clover.

In Field No. 2,058 the herbage is very scanty and poor. It has been down about thirty years. Clover is absent, weeds very plentiful, and the grasses are principally hard fescue, bent grass, cock's-foot, brome grass, and quaking grass. Single plants of tall fescue are noticeable.

Analyses of the soils gave :—

(*Soils dried at 212° F.*)

	No. 2,033*a*	No. 2,058
[1] Organic matter and loss on heating	6·67	7·94
Oxide of iron	3·38	3·68
Alumina	4·70	5·42
Lime	·30	·91
Magnesia	·38	·56
Potash	·34	·39
Soda	·16	·20
Phosphoric acid	·12	·19
Sulphuric acid	·06	·08
Chlorine	·03	—
Insoluble silicates and sand	84·86	80·63
	100·00	100·00
[1] containing nitrogen	·17	·24

These analyses show several differences between the two soils, No. 2,058, though the thinner soil, being the richer. The difference in lime is noticeable, 2,033*a* having a manifest deficiency, while 2,058, owing to the greater nearness of the chalk substratum, is richer in it. 2,033*a* is also poor both in phosphoric acid and in nitrogen.

The soil of No. 2,033*a* is a somewhat light loam, of yellowish-brown colour, having about 8 inches of top soil, with sub-soil of heavier and clayey character, about 6 feet deep, and resting on chalk. It is much broken up by large flints and pebbles. The field is always grazed.

The soil of No. 2,058 is of a light brown colour; there is a top soil of 7 to 8 inches, interspersed with flints and chalk stones. There is only a thin sub-soil of clay loam and then the chalk is reached. This field also is regularly grazed.

BROADFIELD. No. 2,033*a*.

The plan of experiment was:—

Limed throughout with 4 tons lime per acre	6*b*	5*b*	4*b*	3*b*	2*b*	1*b*
	Pond Mud	Farmyard manure, 12 loads per acre	Salt, 5 cwt. per acre	Mineral superphosphate, 3 cwt., and Kainit, 2 cwt. per acre	Basic slag, 8 cwt. per acre	No manure
Unlimed throughout	6*a*	5*a*	4*a*	3*a*	2*a*	1*a*

6 plots—1 acre each.

The lime was applied to the limed half from December 23, 1895, to early in January 1896, pond mud at the same time, basic slag, superphosphate, kainit, and salt on January 27, 1896, and farmyard manure on February 8.

The field has been grazed each year as before.

The first change noticeable was a considerable increase in the clover on the basic-slag plot (2), and that farmyard manure (plot 5) had given the most growth, and produced the thickest bottom. The farmyard manure was London dung, costing 5*s.* per ton delivered. Salt had done no good, and pond mud seemed ineffectual. By the autumn of 1897 it was clear that the liming had produced a marked benefit. This was the case on every plot except the dunged one (5*b*). Where lime was used alone (1*b*) the plot was well grazed, and the pasture evidently sweetened. Basic slag produced, both with and without lime, the most clover, and the basic-slag and lime plot (2*b*) was, on the whole, the best plot of the series. Superphosphate and kainit (plot 3) was hardly so good. Salt (plot 4*a*), apart from lime, did no good, and the pond mud plot (6*a*) was by far the roughest of all, great patches of

rough grass being left. In the dunged plots (5*a* and 5*b*) an anomaly was apparent, for, while the dung alone (plot 5*a*) showed great improvement, and the plot was closely grazed, that on which lime also had been applied (5*b*) was far more clumpy, and not so well eaten.

FIELD, No. 2,058.

The plan of experiment was :—

Farmyard manure, 10 loads per acre	Pond mud and lime	Lime, 2 tons per acre	Basic slag, 6 cwt. per acre	Basic slag, 6 cwt., and Kainit, 2 cwt. per acre	Super-phosphate, 3 cwt., and Kainit, 2 cwt. per acre
6	5	4	3	2	1

6 plots—$\frac{1}{4}$ acre each.

The manures were put on in January 1896, except the farmyard manure, which went on in the middle of February.

The dry weather in 1896 affected these plots seriously, and the grass was very much burnt up. Visiting the site in late autumn 1897, it was apparent that basic slag had effected some improvement, and brought up clover, which before had been not noticeable in the field. An equal and similar result was produced by the use of superphosphate and kainit (Plot 1) ; but the addition of kainit (Plot 2) to basic slag made no apparent alteration. Lime alone (Plot 4) improved the herbage and brought out some clover. The pond mud (Plot 5) left the grass in very rough patches, and the plot was not well grazed. The farmyard manure (Plot 6) produced in summer the most herbage, but there was no clover, and the ground was very full of moss, thus presenting a marked difference to the other plots.

The conclusions from these experiments are :—

1. That liming on land such as that of Field No. 2,033*a* (shown by analysis to be deficient in lime) is undoubtedly the best practice.

2. That basic slag is the next best thing to use, and prompts the growth of clover.

3. That salt is useless for the purpose of sweetening rough grass land.

4. That pond mud is ineffectual and increases the coarseness and roughness of the herbage.

5. That when soil (like that of Field No. 2,058) is not deficient in lime, superphosphate will answer equally as well as basic slag.

	County	Locality and farm	Formation
11.	Hampshire	Basingstoke, Woodgarston	Clay loam on chalk

The selected field is on the property of Sir Edward Bates. It has been twelve to fourteen years in grass.

Mr. Carruthers reported :—

"The herbage of the field consists of the following grasses :—Cock's-foot and dog's-tail are the most abundant, then come meadow fescue and rye grass, and after them hard fescue and yellow oat grass. Brome grass occurs in small patches over the field. There is a very good bottom of white clover all over the field, and scattered plants of red clover. The weeds are not very abundant—they are chiefly wild carrot and ribwort, with a lesser quantity of bartsia."

Analysis of the soil gave the following results :—

(*Soil dried at* 212° *F*)

[1] Organic matter and loss on heating	6·41
Oxide of iron	4·63
Alumina	6·11
Lime	·74
Magnesia	·55
Potash	·36
Soda	·12
Phosphoric acid	·10
Sulphuric acid	·04
Chlorine	·02
Insoluble silicates and sand	80·92
	100·00
[1] containing nitrogen	·13

This soil has a fair, but not large proportion of lime; there is less potash than one would expect in so heavy a soil, and it is deficient both in phosphoric acid and in nitrogen. The top soil is yellowish-brown in colour, and decidedly of a clayey character. Flints are interspersed in it. The sub-soil is a reddish-yellow heavier clay.

Six acres of the field were selected, and the plan of experiment was arranged as follows :—

Lime, 2 tons per acre	Superphosphate, 3 cwt., Kainit, 2 cwt. per acre	Basic slag, 8 cwt. per acre	Dung, 15 loads per acre	Dissolved bones, 4 cwt. per acre	No manure
6	5	4	3	2	1

6 plots—1 acre each.

The manures were all put on about the middle of January 1896. The field has generally been fed every year, and was so in 1896. In 1896 there was little to observe, but by the autumn of 1897 differences were clearly visible. Decidedly the best plot was Plot 5, on which superphosphate and kainit had been used. The next best was Plot 4, manured with basic slag, and after that came the

lime (6) and the farmyard manure (3) plots, which were about equal. The one application that did not, so far, seem to have done any good was that of dissolved bones (Plot 2). The superphosphate and kainit plot was the greenest looking, and the one most closely eaten. Where patches of the old rough grass were left, clover was finding its way through them, and the clumps were being gradually eaten round by the stock. The basic-slag plot had rather more rough grass on, but bits of the pasture here and there were excellent and full of clover. The dung produced, in the dry season of 1896, the largest crop, but there was less clover, and the general appearance not so good as with Plots 4 and 5. Lime had improved the herbage and greatly reduced the amount of moss. Clover, too, was coming up thickly in places, but the whole plot had a rough and a somewhat brown look compared with other plots.

The general result here was to show :—

1. That on a soil such as this, deficient (as the analysis shows) both in phosphoric acid and in potash, but containing a fair proportion of lime, superphosphate and kainit will do quite as well as, and indeed rather better than, basic slag.

2. That basic slag may be usefully employed on a heavy soil poor in phosphoric acid.

3. That lime is not essential, but reduces the amount of moss.

4. That farmyard manure is beneficial in a time of drought.

	County	Locality and farm	Formation
12, 13, and 14.	Durham	Bishop Auckland, Binchester Whins	Coal measures
		(12) "Bell Hills"	
		(13) "Sheep Pasture"	
		(14) "Wilkinson's Land"	

The selected fields are on the property of Messrs. Bolckow, Vaughan & Co., and are managed by Mr. H. G. Burkitt.

"Bell Hills" field is 23 acres in extent and has been in grass for fifteen years, almost the whole of which time it has been grazed with cake. It is a field covered with a quantity of hard wiry grass and much moss.

"Sheep Pasture"—27 acres in area—has been similarly treated, but has only been in grass for eleven years, and the herbage is not so thick or coarse as on "Bell Hills."

"Wilkinson's Land" was a wild barren field, full of weeds, with gorse bushes, hawthorn, brambles, and rushes scattered over it. What grass there was consisted mainly of twitch and Yorkshire fog, and the field looked a regular type of land left to run to waste. No manure of any kind was known to have been ever used on it, and 1s. an acre would probably have fully represented its value at the time the experiment began. If anything would change the appearance of this land and alter its value, here indeed was an opportunity of putting it to the test! Analyses of the soils gave these results :—

(*Soils dried at 212° F.*)

	"Bell Hills"	"Sheep Pasture"	"Wilkinson's Land"
[1] Organic matter and loss on heating	9·54	6·26	5·13
Oxide of iron	3·20	3·37	2·77
Alumina	5·37	5·05	2·70
Lime	·37	·40	·37
Magnesia	·58	·43	·37
Potash	·45	·35	·13
Soda	·16	·21	·14
Phosphoric acid	·21	·11	·06
Sulphuric acid	·05	·02	·03
Insoluble silicates and sand	80·07	83·80	88·30
	100·00	100·00	100·00
[1] containing nitrogen	·29	·16	·13

The "Bell Hills" soil is a brown loam of somewhat heavy nature, the top soil not being 7 inches deep, after which comes a rather lighter coloured sub-soil, not widely different in texture.

The soil of "Sheep Pasture" is rather blacker than the foregoing. After $7\frac{1}{2}$ inches of top soil comes a sub-soil of yellowish-red sand with clay.

"Wilkinson's Land" has a blackish top soil of $2\frac{1}{2}$ inches, followed by yellowish-red sand and clay mixed, and a sub-soil of lighter colour and more sandy.

The analyses show that "Wilkinson's Land" is one of a very impoverished nature. It is lighter and much poorer than "Bell Hills," and is deficient in lime, potash and nitrogen, and exceptionally so in phosphoric acid.

"Bell Hills" is a better soil; it has, seemingly, fair proportions of potash, phosphoric acid, and nitrogen, but is deficient in lime. The soil of "Sheep Pasture" is not widely different from that of the adjoining field ("Bell Hills"), but, having been a shorter time under grass, has not so much accumulation of organic (vegetable) matter nor of nitrogen. It has also considerably less phosphoric acid.

"Bell Hills."

On "Bell Hills" 5 acres were taken and the plan devised was:—

Lime, 2 tons per acre	Basic slag, 8 cwt. per acre	No manure	Basic slag, 6 cwt., Kainit, 2 cwt. per acre	Farmyard manure, 12 loads per acre
5	4	3	2	1

5 plots—1 acre each.

The manures were all put on in January 1896. Even in the first year an improvement was noticeable, more particularly on the lime plot (5) and the dung plot (1). In 1897 the grass came away very strongly at the end of June and the cattle were not able to keep it down. The area covered by the experimental plots presented, however, in October 1897, quite a contrast to the rest of the field, for, though there was still a good deal of coarse grass on the plots, immediately outside them the long wiry grass, rejected by the stock, stood up like a wall of division between the plots and the untreated part. Moreover, on the plots there began to show green patches where the cattle had been feeding more closely. As between the individual plots there was no very marked difference; for choice, Plot 2 (basic slag and kainit) was the best. The lime plot (6) was also well eaten and white clover was making its appearance. The farmyard manure plot (1) had, possibly, the most grass, but certainly less clover than the rest.

"Sheep Pasture."

Three acres were marked out in "Sheep Pasture" as follows:—

3	2	1
Basic slag, 8 cwt per acre	No manure	Lime, 2 tons per acre

3 plots 1 acre each.

The lime and basic slag were put on in January 1896. Already that same autumn the limed plot could be distinctly seen from a distance by reason of its bright green look and the closeness with which it had been grazed. On the basic-slag plot quantities of white clover began to show, while the "no manure" plot had a quantity of red and stalky kind of herbage which the stock had left untouched. These appearances were maintained in 1897, except that the basic slag had, by the autumn, produced such a bed of white clover that it was a question whether there might not be too much of it and too little grass. The lime plot remained very nice, with more grass and a fair mixture of clover.

"Wilkinson's Land."

Six acres of this were taken for experiment, and as Mr. Carruthers advised the attempt to be made to get rid of some of the twitch by harrowing and then re-seeding, one half of the area was so treated. The gorse bushes, hawthorn, brambles, &c., were also cut down. The 6 acres were divided thus:—

	6b	5b	4b	3b	2b	1b
Upper half harrowed and re-seeded	Basic slag, 8 cwt per acre	Lime 4 tons per acre	Farmyard manure, 15 loads per acre	Bone meal, 4 cwt per acre	Mineral superphosphate, 4 cwt and Kainit, 3 cwt per acre	Basic slag, 6 cwt. and Kainit, 3 cwt per acre
	6a	5a	4a	3a	2a	1a

Area—6 acres.

The harrowing and manuring were done in January 1896 and the re-seeding of the upper half in March.[1] By the autumn a most pronounced change showed itself in the appearance of the plots as distinguished from the rest of the field. It was quite clear, also, that the harrowing and re-seeding of the upper half of the plots had been attended with beneficial results. Still, even where this had not been done, the manures applied had, in most cases, effected quite an alteration in the pasture. Perhaps the dung plot (4) was the best of all and had the thickest bottom of grass; but basic slag had also improved the grass immensely. By October 1897 a most striking contrast was presented, the transformation of some of the plots—notably the basic slag one (6) and the farmyard manure plot (4)—being remarkable. On passing from the outside on to the basic-slag plot (6) the character of the herbage seemed to be quite altered, clover was abundant on the plot, while none was visible outside, the herbage had been closely grazed and the sheep droppings lay thick upon it, as they did also on the farmyard manure plot (4). The lime plot (5) had been eaten closest in the spring, but now looked hardly as well as either of those named already.

The addition of kainit in Plots 1 and 2 seemed not to produce a marked benefit, and the larger quantity (8 cwt.) of basic slag did better than the smaller (6 cwt.) with 3 cwt. of kainit added.

The harrowed and re-seeded half continued to be distinctly better than the lower half.

The most striking evidence of the improvement wrought in the case of this land is given in the fact that, at the end of the first year, the tenant occupying the land came to ask whether he might treat the rest of the field in the same way that some of the plots had been treated. This request was again preferred in the second year, and no one going over the field could fail to be struck by the great change produced. Mr. Burkitt's own description of the field is that the plots can be seen for over a mile off, and he considers that the lime, basic slag, and farmyard manure have already increased the annual value of the land by 8s. an acre.[1] Doubtless the field had been starved before, but, even in such cases, it is highly desirable to know what manures are best to apply. Where the better grasses

[1] For particulars of re-seeding, see footnote, p. 148.

and clover were making a start they seemed to be literally pushing before them the weeds and inferior herbage.

These experiments show :—

1. That even waste land like "Wilkinson's land, and such as there exist many hundred acres of in the district, can be immensely improved by proper means, chief among these being the harrowing, re-seeding, and rolling of the land, followed by suitable manuring.

2. That even without this renovating process great good can be effected in a very short time by the use of basic slag.

3. That lime on such soils as those of "Bell Hills," "Sheep Pasture," and "Wilkinson's Land" (deficient in lime) can be very usefully employed.

4. That farmyard manure on impoverished soils and starved pastures like that of "Wilkinson's Land" will be very beneficial, and more so than on soils like that of "Bell Hills," already fairly supplied with organic matter and nitrogen.

	County	Locality and farm	Formation
15, 16, and 17.	Yorkshire	Barnsley, New Hall (15) "Low Ing" (16) "Long Ing" (17) "Castle Field"	Coal measures

The first two sites are on the Home Farm of Mr. C. Howard Taylor, of New Hall, near Barnsley. The third is near by. The usual practice on the New Hall Farm is to mow grass land once in 3 years.

"Low Ing" is a field of five acres, the herbage being distinctly poor. The predominant grass is twitch or bent grass, though good grasses like cock's-foot occur with it. There is very little clover.

"Long Ing" is 14 acres in extent. The herbage is similar in character to that of "Low Ing," but the turf, when cut into, shows a thick spongy matting of stems and decaying vegetable matter.

"Castle Field" is 30 acres in extent, and not unlike "Long Ing," but the soil is thinner. The field has always been grazed, but without cake. The field showed a quantity of coarse, wiry, shallow-rooted grasses dying down in masses, and in many parts it was quite easy to kick up with the foot the entire turf and leave the soil bare. Analyses of the soils gave :—

(*Soils dried at* 212° *F.*)

	"Low Ing"	"Long Ing"	"Castle Field"
[1] Organic matter and loss on heating	9·40	8·42	7·25
Oxide of iron	2·59	5·76	5·46
Alumina	7·18	6 05	6·26
Lime	·50	·27	·20
Magnesia	·35	·60	·53
Potash	·38	·35	·26
Soda	·35	·25	·12
Phosphoric acid	·17	·12	·21
Sulphuric acid	·04	·05	·08
Insoluble silicates and sand	79·04	78·13	79·63
	100·00	100·00	100·00
[1] containing nitrogen	·32	24	·18

The soil of "Low Ing" was of a grey slaty colour; there were about 7 inches of rather heavy top soil, then a sub-soil of grey, unhealthy looking clay. At the surface there was a matting of stems and roots quite 1 inch deep.

The soil of "Long Ing" did not appear to be quite as heavy, and had no clay sub-soil. There was, however, a thicker matting of surface stems and roots, forming a sponge of at least 1½ inch in thickness.

The soil of "Castle Field" was very similar to the last named, but, after a depth of 9 inches, had a more clayey sub-soil. There was the same matting of stems and roots as in "Long Ing." The analyses point to the absence in the case of "Long Ing" and "Castle Field" of a sufficiency of lime, and though there is more lime in the "Low Ing" soil, yet the thick matting of roots in all the three soils would lead to the belief that lime could be advantageously applied. On testing the soils it was found that in each case the decaying root matter gave a strongly *acid* reaction, due to the development of organic acids from the decaying vegetable matter, and lime would probably remedy this. Next, phosphoric acid is by no means plentiful in "Low Ing" and "Long Ing." "Castle Field" is poor in nitrogen, nor is there much of this in "Long Ing" either.

Mr. Carruthers advised the harrowing up of the turf in these fields, with a view to reducing the amount of twitch, and then re-seeding the land, using[1] especially some white clover, there being little in the pasture of any of the three fields. The plan of experiment was devised for "Low Ing" as follows:—

"Low Ing."

Lime, 4 tons per acre	Basic slag, 6 cwt., and Kainit, 2 cwt. per acre	Bone meal, 4 cwt. per acre	Harrowed and re-seeded
4	3	2	1

4 plots—1 acre each.

The field was mown in 1896 and grazed in 1897 with sheep having cake. The manures were put on in January 1896.

The re-seeding has, as yet, shown no perceptible improvement, though, owing to drought in the spring of 1896, the seeds were once more sown in autumn. Bone meal (Plot 2) has, so far, effected very little. The best plot, at the present, is Plot 3 (basic slag and kainit), this having the most clover and being the best eaten. The next best is the lime plot (4), there being less clover than on Plot 3, but more bulk of herbage. Also, the condition of the soil is greatly improving on the limed plot, the lime, as it works down, seeming to kill out the

[1] For particulars of re-seeding see footnote, p. 148.

spongy mass of stems and roots, these disappearing and bringing the soil nearer to the surface, so that the roots strike straight down into it. This loss of the matted character of the turf seems clearly a mark of improvement being effected in pasture, and lime would appear to be very effectual in producing it, neutralising, as it does, the acid character of the decaying matter already alluded to. The same effect is being noted in the case of the basic slag and kainit plot (3). A closer grazing of the plots accompanies this change.

"Long Ing."

Lime, 4 tons per acre	Basic slag, 8 cwt. per acre	Basic slag, 6 cwt., and Kainit, 2 cwt per acre	Bone meal, 4 cwt. per acre	Harrowed and re-seeded
5	4	3	2	1

5 plots—1 acre each.

The manures were put on in January 1896. The harrowing was done in March and April 1896, and cost 7*s.* per acre. The field was hayed that year, and grazed in 1897 by horses and cattle with cake.

The general results are much the same as in "Low Ing." Re-seeding (Plot 1) and bone meal (Plot 2) have done little good. Re-seeding had to be done again in the autumn of 1896. The best plot is certainly the limed one (Plot 5), and next comes Plot 4 (basic slag alone, 8 cwt.), this having the most clover. It was rather better than Plot 3, with less basic slag and 2 cwt. of kainit additional.

"Castle Field."

Harrowed and re-seeded	Bone meal, 4 cwt. per acre	Basic slag, 8 cwt. per acre	Lime, 4 tons per acre	Basic slag, 6 cwt., and Kainit, 2 cwt. per acre
5	4	3	2	1

5 plots—1 acre each.

The manures were put on in January 1896. Plot 5 had to be re-seeded twice, as in the other cases, but with the addition of 1 lb. more cock's-foot, as noted at foot of p. 148. The field was grazed in both 1896 and 1897 with cattle and horses. It was noted that the stock frequented the experimental plots more than the rest of the field, and that they seemed to prefer Plots 1, 2, and 3.

In this field the re-seeding seems to have done good, as new grass was coming, and it was not possible any longer to kick up the turf as before. Bone meal as yet showed no result, and the lime

plot (2) was not as good as either of those (1 and 3) with basic slag. The first named (Plot 1), manured with 6 cwt. of basic slag and 2 cwt. of kainit was the best plot, and, on passing on to it from the part lying outside the experiment, there was a clear line of demarcation produced by the altered appearance of the manured plot. The tenant, on going over the two, said he would be willing to give 1*l.* an acre for the one (manured) and not 5*s.* an acre for the other (outside the experiment).

It is remarkable, too, that the belief in the efficacy of bones is very great in the district; but, so far, this has not been justified here. Time, however, must be allowed before a definite conclusion can be drawn. Another noticeable feature was that, on cutting down into the soil through the turf, wherever the soil was improved, and the matted mass of stems had disappeared, moisture was found to be penetrating below, whereas on the unimproved part the soil was quite dry a short depth below the surface.

The general conclusions are :—

1. That lime is very useful on heavy soils like these, deficient in lime, and where the turf is matted together in a spongy mass on the surface.

2. That basic slag, or basic slag with kainit, effects a marked improvement.

3. That bone meal is, at best, very slow in action.

	County	Locality and farm	Formation
18, 19, 20.	Herefordshire	(18) Morton Jeffries, nr. Hereford	Old red sandstone
		(19) Bodenham, nr. Hereford, England's Field, No. 10	"
		(20) Bodenham, nr. Hereford, England's Field, No. 13	"

The first site is a field of 15 acres, at Morton Jeffries, about five miles from Hereford. It was laid down twelve years ago, but has had no manure given it, nor cake fed on it. There was a thin covering only of grass, containing a deal of twitch, but good grasses were among it, and a considerable amount of white clover—though all had a poor and stunted appearance. There were also many weeds, including black caps (*Luzula campestris*).

The two other sites were at Bodenham, on the estate of Mr. J. H. Arkwright, of Hampton Court, Leominster. "England's Field, No. 10" consists of 21 acres, and had been twenty-two years in grass. It is always grazed, but no cake is given. Twitch or common bent grass is the principal grass, with dog's-tail; cock's-foot and white clover occur, and a good deal of *Luzula campestris*.

"England's Field, No. 13," is 25 acres in extent, and has been allowed to "tumble down" to grass. The herbage is chiefly twitch, dog's-tail, and Yorkshire fog. There are many plants of

bramble, wild rose, whitethorn, and gorse over it, and everything is in a very impoverished condition.

Analyses of the soils gave :—

(*Soils dried at* 212° *F.*)

	Morton Jeffries.	England's Field, No. 10	England's Field, No. 13
[1] Organic matter and loss on heating	5·53	5·17	3·98
Oxide of iron	1·17	3·69	3·36
Alumina	5·39	5·03	4·19
Lime	·82	3·83	·36
Magnesia	2·11	1·40	1·34
Potash	·57	·54	·52
Soda	·25	·22	·19
Phosphoric acid	·12	·18	·12
Carbonic acid	—	2·25	—
Sulphuric acid	·09	·09	·04
Insoluble silicates and sand	80·95	77·60	85·90
	100·00	100·00	100·00
[1] containing nitrogen	·13	·15	·11

The "Morton Jeffries" soil consists of 6 inches of red top soil, a rather heavyish red loam, then becoming heavier and more marly. It is deficient in phosphoric acid and nitrogen, but has plenty of lime and potash.

The plan for Morton Jeffries was :—

"Morton Jeffries."

8	7	6	5	4	3	2	1
Mineral super-phosphate, 4 cwt. per acre	Basic slag, 8 cwt. per acre	No manure	Bone meal, 4 cwt. per acre	Dissolved bones 4 cwt. per acre	Mineral super-phosphate, 3 cwt., and Kainit, 2 cwt. per acre	No manure	Seeds scattered over
					Mineral super-phosphate, 3 cwt., Kainit, 2 cwt., and Nitrate of soda, 1 cwt. per acre 3*a*		

8 plots—1 acre each.

"England's Field, No. 10," has 7 to 8 inches of top soil, with which limestone is interspersed, the analysis showing much lime present. There is a fair proportion of phosphoric acid, but a deficiency of nitrogen.

"England's Field, No. 13," is somewhat similar soil to that of

Field No. 10, but has not the limestone interspersed. It is, indeed, rather poor in lime, though the chief deficiencies are in organic matter and nitrogen. There is little phosphoric acid either.

All three soils contain a quantity of magnesia.

Mr. Carruthers advised the scattering of seeds of timothy, cock's-foot, and meadow grass over the surface of the land, in the case of "Morton Jeffries" and "England's Field, No. 10," as there were many bare patches on these. This was done without any preparation of the soil.

The seeds sown on Plot 1 were 4 lb. cock's-foot, 2 lb. meadow fescue, $\frac{1}{2}$ lb. rough-stalked meadow grass, 2 lb. timothy, 1 lb. white clover, and $\frac{1}{4}$ lb. of yarrow. This was done in April 1896.

The manures were put on in January 1896, except the nitrate of soda on Plot 3*a*, which went on in the third week of April.

By November 1897 it did not appear that the seeds sown had come up much, though the plot seemed rather greener than the adjoining "no manure" plot. The two most improved plots were Plot 7 (basic slag alone) and Plot 8 (mineral superphosphate alone). On coming on to these plots from the part lying outside the experiment, there was a clear line of demarcation visible, the herbage on these two plots being well eaten down, whilst outside them the bents stood up like a miniature forest.

The superphosphate plot (8) was the most even and best eaten of all, though the basic slag produced more clover. None of the other applications had nearly such a marked influence, not even where nitrate of soda (3*a*) had been used, the plot being very rough in parts. Dissolved bones had hardly done as well as bone meal. Kainit (as the analysis of the soil would seem to indicate) was not called for.

It had been remarked that the sheep grazed in 1897 on Plots 7 and 8 principally, whereas, previous to this, they seldom used to go to that end of the field at all.

"England's Field. No. 10."

Lime, 2 tons per acre	Basic slag, 8 cwt. per acre	Mineral superphosphate 3 cwt., and Kainit 2 cwt per acre	Bone meal, 4 cwt. per acre	No manure	Seeds scattered over
6	5	4	3	2	1

6 plots—1 acre each.

The manures were applied in January 1896, and the seeds sown in April.

In this field basic slag (Plot 5) has made a wonderful improvement. Stock are much more on this plot than on any of the others, as is clearly shown too by their droppings lying on it. Both lime (Plot 6) and superphosphate and kainit (Plot 4) have done good, but nothing like that effected by basic slag.

The fresh seeding (Plot 1) has done little good as yet.

"ENGLAND'S FIELD. No. 13."

Lime, 4 tons per acre	Basic slag, 8 cwt. per acre	Dissolved bones, 4 cwt. per acre	Salt, 5 cwt. per acre	No manure
5	4	3	2	1

5 plots—1 acre each.

Here, again, the only plot on which real good has been produced is the basic slag one (Plot 4). This presents a green appearance, and the bents are nearly all gone. The salt (Plot 2) has not induced the stock to eat the herbage the least bit better, nor has lime, in this case, as yet effected any change.

From these experiments it would be concluded :—

1. That on these old red sandstone soils basic slag is the best material to apply when lime and phosphoric acid are deficient.

2. That, if lime be present in sufficiency, superphosphate may be used to advantage.

	County	Locality and farm	Formation
21.	Cambridgeshire	Ely, Wilburton	Gault

The selected field is one 8 acres in extent, on Crow's Farm, Wilburton, near Ely, belonging to Mr. Albert Pell. The pasture was about twelve years old, but the herbage was in a miserable and stunted condition. The soil is a stiff clay, which becomes water-logged in winter, and in summer gets dry, hard, and burnt up. The field was much covered with moss, very little clover was to be seen, though a quantity had been sown, cock's-foot was fairly abundant, but very stunted in growth, and, altogether, the herbage was very bare. The practice here is to graze stock on the grass land without cake, and, when occasionally a cut of hay is wanted, to put on a dressing of farmyard manure.

It is stated that within the last forty years this land, which formed part of Grunty Fen, has shrunk a great deal, and the surface become lowered. The first two inches of soil are black and very hard, the roots of the grass not seeming to penetrate into it, or to send out rootlets. After the first two inches it is not so hard or close, but at nine inches depth a yellow clay, going many feet down, is met with, which seems only fit for making bricks. The water does not seem to get properly to the drains, which only run in time of heavy rain. It would seem, on such a soil that, if only the hard surface could be broken up, and then new seed be sown, and if the plants were able to penetrate into the soil, a pasture might be obtained.

Accordingly, the suggestions for improving the land contained proposals for breaking up the surface and re-seeding the land.

Analysis of the soil showed it to have apparently plenty of

plant food, if only this could be brought into action. The results were :—

(Soil dried at 212° F.)

[1] Organic matter and loss on heating	12·12
Oxide of iron	2·72
Alumina	7·00
Lime	1·33
Magnesia	·69
Potash	·66
Soda	·30
Phosphoric acid	·09
Sulphuric acid	·07
Insoluble silicates and sand	75·02
	100·00
[1] containing nitrogen	·44

The only marked deficiency was in phosphoric acid. In organic (vegetable) matter and in nitrogen the soil, though supposed to be exhausted, was rich rather than otherwise. There was also plenty of lime and of potash.

This field was only taken up for experimental purposes in December 1896. The plan of treatment advised was :—

<table>
<tr><th>5 acres</th><th></th><th colspan="2">3 acres</th></tr>
<tr><td>1. Lime, 4 tons per acre</td><td rowspan="5">PATH.</td><td rowspan="5">Harrowed and re-seeded
6</td><td rowspan="5">Worked with French aerating tool
7</td></tr>
<tr><td>2. Basic slag, 8 cwt. per acre</td></tr>
<tr><td>3. No manure</td></tr>
<tr><td>4. Basic slag, 6 cwt. } per acre
Kainit, 3 cwt. . }</td></tr>
<tr><td>5. Mineral superphosphate, 3 cwt. } per acre
Kainit, 2 cwt. . . . . }
Nitrate of soda, 1 cwt. . . }</td></tr>
</table>

On the 3 acres on the right-hand side of the path it was determined to try : (1) on one half, the ordinary harrowing and cross-harrowing with a view to opening up the surface soil somewhat, and then re-seeding, and (2) on the other half, the effect of using a

French tool designed for the purpose of opening up and aerating the soil. The knives or coulters of this machine were drawn through the turf to the depth of four to six inches. On the remaining 5 acres of the field the manures, as given in the plan, were applied early in April 1897, the renovating seeds being sown about the same time.

It is very early, of course, yet to form any conclusions, but so far as an inspection early in December 1897 could tell, it would seem that neither the harrowing and re-seeding, nor the work of the aërating tool, had been at all successful. The new seeds did not appear to have come up. The manured plots presented much more favourable appearances. The lime (Plot 1), though it had not had time to work properly in, seemed to have killed down the tufts of coarse grass. Basic slag (Plot 2) probably had not had time to work either. A rather greater improvement was shown on Plot 4 (basic slag and kainit), clover coming strongly, but by far the closest eaten plot was 5, where superphosphate, kainit, and one cwt. of nitrate of soda had been put. The droppings of the cattle were thick over this plot and the stock had evidently frequented it most. The consequent treading seemed to have knocked the moss out greatly. There is little doubt that the more quickly acting manures, the nitrate of soda in particular, had given the grass a start, and the stock went off in search of the new growth. Certainly this was the greenest plot of all, the best eaten, and the one most free from weeds and moss. How long the improvement will be kept up remains to be seen.

County	Locality and farm	Formation
22. Essex	Hatfield Peverel, Fairstead	London clay

This site is on Lord Rayleigh's property, and was only taken up for experimental purposes in April 1897, so that there is little to record as yet. The field is one of old grass, but the herbage is thin and looks as if it needed manure by way of helping it. The field has always been grazed by dairy cows, besides being frequently mown, and has had little on it beyond an occasional dressing of farmyard manure. The soil is a somewhat heavy clay of a light brown colour with sub-soil of heavier yellow clay. Analysis of it gave :—

(*Soil dried at* 212° *F.*)

[1] Organic matter and loss on heating	8·12
Oxide of iron	2·21
Alumina	2·63
Lime	·30
Magnesia	·19
Potash	·20
Soda	·16
Phosphoric acid	·13
Sulphuric acid	·05
Insoluble silicates and sand	86·01
	100·00

[1] containing nitrogen . . . . . ·29

The soil is deficient in lime and in potash, and has only a moderate amount of phosphoric acid, though fairly supplied in nitrogen. It ought to be one that manuring would benefit.

The plan of experiment devised was :—

Re-seeded with cock's-foot		Re-seeded with timothy	
Basic slag, 8 cwt. per acre	Superphosphate, 3 cwt., Kainit, 2 cwt., Nitrate of soda, 1 cwt per acre	Lime, 4 tons per acre	No manure
4	3	2	1

4 plots—1 acre each.

At the top of the field the experiment has been tried of scattering seeds of timothy in the one case, and seeds of cock's-foot in the other, over small strips of the plots. Owing to the late period of the inception of the experiment the manures could not be put on until April 1897, but, already by October, there was a marked improvement to be seen, which was clearly visible from the hill opposite to the field in question. The manured plots presented a greener and more closely eaten appearance than the rest of the field. The best plot was No. 4 (basic slag alone), then came Plot 3, on which nitrate of soda had been used with superphosphate and kainit. The nitrate, as in the Wilburton experiment (No. 21), had evidently given a growth of grass which attracted the stock. Still, this plot was rougher than Plot 2, on which lime had been put, for, though the lime had had very little time to act, yet the grass seemed decidedly finer and the stock had eaten it well. The lime plot in this respect showed a marked contrast to the adjoining "no manure" plot. It was too early to tell whether the re-seeding had done any good.

Summary.

It is clearly too early yet to draw any but the most general conclusions from the experiments so far as they have gone. Better would it be to take them individually and apply their lessons to the cases of lands of similar class to those described.

But one or two points stand out, on which general remarks may be made.

Where improvement has been tried, it has been most generally on soils where the poverty is due to the presence of bad grasses, notably of twitch or bent grass (*Agrostis vulgaris*). Not only is this grass rejected by stock, but, owing to the matting of creeping stems on the surface of the ground, other grasses are smothered and new seeds sown are prevented from reaching the soil.

The attempts to get rid of this mass of twitch by harrowing and then re-seeding, have been variably successful. Where failure has occurred it has been due mainly to the dryness of the season, which has prevented the proper germination of the seed. In some cases the cost of harrowing has been stated to be prohibitive (e.g. Tatton Park, No. 4), while in others (Tabley, No. 5), when less expense has been incurred, the result has not been attained. By way of contrast, again, at Brocklesby (No. 6), though only at the cost of 7*s.* an acre, a most satisfactory result has followed, and the same may be said for No. 14 (Wilkinson's land, Bishop Auckland). Where the new seeds have been able to get to the soil the improvement has been very marked, though it remains to be seen how long the new grasses will be able to hold their own against the twitch still remaining in the land.

But the experiments have further shown that, of all the manurial agents employed, lime has been the one most effectual in improving pastures in which twitch is predominant. This it does, not by altering the *kind* of grass in the pasture, but by sweetening it and rendering it palatable to stock.

In several cases inferior pasture has been the result of an impervious soil, water-logged in winter and dried up in summer. However well supplied such a soil may be in actual plant food, there is the necessity of means for making this available; and, so far, the experiments have not pointed out any really good mechanical way of effecting this desired change.

In the absence of this, however, it has been clearly shown that basic slag may, in a great number of cases, be usefully employed. How long the improvement will last is a matter for continued experiment, but the results are undoubtedly promising. The increase of clover is very marked when basic slag is put on.

In some cases poorness of pasture has been due chiefly to actual poverty of soil, and its deficiency in certain constituents. So far as these have been marked out beforehand by chemical analysis of the soil, there has been, on the whole, a very satisfactory confirmation of the forecast, in the results derived from using manures containing the ingredients lacking in the soil. Notably has this been so with soils poor in lime (e.g. Tatton Park No. 4, Brocklesby No. 6). Basic slag has proved, generally, an efficient means of supplying both lime and phosphoric acid when these have been deficient; but, in the presence of enough lime, mineral superphosphate has been quite as beneficial as basic slag.

Another striking feature is the slowness of action of bone meal. It may be that, later on, benefit may be shown from its application, but, as yet, there is little to point to.

Kainit has occasionally been a useful addition to basic slag or superphosphate, but not generally.

Nitrate of soda has, in the few cases tried, produced a rush of grass for the time, which has taken stock to the part so dressed, but at present not more than this can be said.

Farmyard manure has, in a dry season, been useful in a similar

way to nitrate of soda, but its effects must be tested longer. On land such as that of Cheshire, it is very clear, however, that farm-yard manure, or cake-feeding of stock, following the liming of the land, has been the best practice.

Gas lime has proved effective in killing down rough grass, but salt as a sweetener of pasture has not been successful. Pond mud and road scrapings also have done but little good.

One or two of the experiments, notably Tabley (No. 5) and Laxton (No. 7) have been disappointing in the way of yielding results, but at nearly all the other sites definite improvement from one kind of treatment or the other can be clearly shown.

The greatest changes effected have been in the case of "Wilkinson's land," Bishop Auckland (No. 14), where waste, tumbled-down pasture has been converted already into fair pasturage; Brocklesby (No. 6), where harrowing, re-seeding, and liming have got rid of a great deal of the twitch and produced an improved and even pasture, and Barnsley (No. 17), where basic slag has effected a marked change in the value of the pasture.

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ON ECONOMY IN ROOT-FEEDING: AN EXPERIMENT IN BULLOCK-FEEDING AT WOBURN, 1896–97.

DURING the winter of 1895–96 an experiment was carried out at the Woburn Experimental Farm with the object of ascertaining whether it was good policy to limit the quantity of roots given to fattening bullocks, or if it were better to give them practically as many roots as they would eat. The experiment is reported in the Journal R.A.S.E., vol. vii., part iii. (1896), pp. 560–67. In that case the bullocks used were Herefords, and the amounts of roots consumed, on the average, by the respective sets of bullocks, were:—*Heavy* feeding, 50 lb. per head daily, *light* feeding, 35 lb. per head daily. The conclusion drawn was that, after taking into account the prices obtained for the cattle (dead weight), the cost of the feeding, and the value of the manure left, there was practically nothing to choose between the two systems, and that, accordingly, in the event of there being a short root-crop, economy in feeding roots to stock might advantageously be practised.

With the object of confirming, or otherwise, this conclusion, a repetition of the experiment, with certain modifications, was decided upon.

In the 1895–96 experiment Hereford bullocks were used, and as

it was urged in some quarters that Herefords were more particularly suited for fattening off on grass rather than in sheds on roots, it was resolved to carry out the fresh trial with Shorthorn bullocks. With these we looked to a very much higher consumption of roots by the cattle than had been the case with the Herefords of the previous year, it being a well-known fact that the class of Shorthorns (mostly of Irish breeding) used in Norfolk for fattening off on roots will consume readily 1 cwt. per head of roots daily. Despite this, it will be seen that with the English-bred Shorthorns used at Woburn the utmost quantity of roots that the animals could be got to consume was 64 lb. per head daily, while those on the limited root diet were given about 35 lb. each daily. Such variation of experience must be accounted for by the differences, firstly, in the cattle, and secondly, in the quality of the roots. These are circumstances which it is not possible to regulate, but which have to be borne in mind wherever experiments are carried out. The results cannot be taken without reference to the local surroundings, nor can rules be at once laid down for universal application. The necessity for extension of such trials under varying conditions is, indeed, the point most clearly brought out. Still, as I observed last year, farmers feed their cattle off on roots in sheds in Bedfordshire as well as in Norfolk, and there are many parts of the country where like conditions prevail to those at Woburn, as compared with the great root-growing capabilities of such counties as Norfolk and Northumberland.

The bullocks used in the experiment were sixteen Shorthorns, rising three years old, purchased on November 14, 1896, at Stanton Harcourt, near Oxford, the actual price paid being 13*l*. 15*s*. each. This, together with railway charges (2*s*. 7*d*. per head), would bring the cost of the bullocks on the farm to 3*s*. 5*d*. per stone of live weight. They were all fed alike from November 16 to December 1, and at the commencement of the present experiment they were valued at 14*l*. 10*s*. per head. The accommodation for feeding bullocks at the Woburn Farm has been frequently described before, viz., special feeding-boxes for eight animals, a covered shed holding four more, and an open yard for yet other four. The sixteen bullocks were divided into two sets of eight each, the individuals of either set being distributed as follows: four in the boxes, two in the shed, and two in the yard.

The plan of feeding was that each set should have the same kind and amount of cake and corn, but that while one lot was to have as much roots as the animals would consume, the other lot was to have a *limited* supply only of roots; chaff was to be given as required.

The artificial foods were :—

	lb.		lb.
Linseed cake, beginning at	2	per head daily, and increasing gradually to	3
Decorticated cotton cake	2	„ „ „ „	3
Barley (grittled)	2	„ „ „ „	3
	6		9

The chaff employed was at first meadow hay and oat straw, half and half, then meadow hay and wheat chaff, half and half, and, finally, meadow hay and a little clover hay to end up with. While the kinds of chaff were kept the same for both sets, the quantities were allowed to vary according to the likings of the animals, the chaff being accordingly given *ad libitum.*

The roots used were swedes throughout, and water was given *ad libitum*, but the quantity was recorded.

As usual in these experiments, samples of the foods used were set aside weekly; and these were analysed monthly, Table I. representing the average composition of the foods employed throughout.

TABLE I.—*Analyses of the Foods used during the Experiment.*

—	Linseed cake	Decorticated cotton cake	Barley (grittled)	Meadow hay chaff	Oat straw chaff	Wheat chaff	Swedes
Moisture	13·22	10·05	17·00	13·70	17·37	13·25	90·76
Oil	11·39	11·73	1·93	3·30	2·42	2·69	—
[1] Albuminous compounds	26·38	47·87	11·85	9·54	5·00	6·35	1·58
Starch, sugar, digestible fibre, &c.	34·93	20·91	62·93	42·83	41·46	41·35	6·18
Woody fibre	7·62	3·64	4·05	23·03	27·29	22·91	·83
Mineral matter (ash)	6·46	5·79	2·24	7·60	6·46	13·45	·65
	100·00	100·00	100·00	100·00	100·00	100·00	100·00
[1] containing nitrogen	4·22	7·65	1·90	1·52	·80	1·01	·25

The costs of the respective foods, including cartage, preparation, &c., were :—

	£	s.	d.	
Linseed cake	7	12	6	per ton
Decorticated cotton cake	6	5	0	,,
Barley	5	0	0	,,
Meadow hay chaff	3	0	0	,,
Clover hay	3	15	0	,,
Oat straw	1	15	0	,,
Wheat chaff	1	10	0	,,
Swedes (say)	0	7	0	,,

At the time the experiment began, the *light* root-feeding lot were supplied with 28 lb. of swedes per head daily. This quantity was increased after ten days to 35 lb., at which amount the animals remained until the close of the experiment. The *heavy* root-feeding lot, on the other hand, began with 42 lb. of swedes per head daily; after ten days this was increased to 56 lb., and much beyond this

the animals would not, as a rule, go. Those in the boxes, indeed, never took more, but in the shed and the open yard they went up to 60 lb. each per day during January. On the attempt being made to raise the amount to 70 lb., the animals refused to eat them, and dropped to 60 lb., rising again ultimately to 64 lb.

The variations in the amounts of swedes, chaff, and water consumed by the two sets of beasts can be best explained by Table II.

TABLE II.—*Average Daily Amounts of Swedes, Chaff, and Water Consumed per Head by the Two Sets of Bullocks during the Experiment.*

Date	Set I.—*Heavy* root-feeding			Set II.—*Light* root-feeding		
	Swedes	Chaff	Water	Swedes	Chaff	Water
1896	lb.	lb.	lb.	lb.	lb.	lb.
Dec. 4–12	42	12½	45¼	28	13	58¾
„ 13–19	53¼	14½	44¾	34½	15¾	64
„ 20–26	55½	14¼	45¼	35	16	60
„ 27–Jan. 2	55¾	15	45¼	35	16	62
1897						
Jan. 3–9	58	15	43	35	17	63¼
„ 10–16	59½	14½	37½	35	16½	59½
„ 17–23	59¾	14¼	31	35	16½	52¾
„ 24–30	58½	14	30⅔	35	16½	50
„ 31–Feb. 6	58	13½	30	35	16	49¾
Feb. 7–13	57½	13½	31½	35	15¾	53¼
„ 14–20	58	13¾	37½	35	16¼	53½
„ 21–27	59½	15	41½	35	17	59¼
„ 28–Mar. 6	60½	15½	40½	35	17½	59
Mar. 7–13	59	15	36⅔	35	17	56½
„ 14–20	57½	14½	35	35	16½	57
„ 21–27	56	14½	43	35	16	56
„ 28–April 3	56	14	44	35	16¼	54
April 4–10	56	14½	46	35	16	54
„ 11–17	—	—	—	35	16½	58
„ 18–24	—	—	—	35	17	64

This gives an average daily feeding per head throughout the whole period as follows:—

	Heavy root-feeding	Light root-feeding
	lb.	lb.
Linseed cake	2·7	2·7
Decorticated cotton cake . . .	2·7	2·7
Barley	2·7	2·7
Chaff	14·3	16·2
Swedes	56·6	34·6
Water	39·3	57·7

The consumption of the lesser quantity of roots by the second set thus enabled them to take about 2 lb. more chaff per head daily than the others. If we take the swedes as containing 90 per

cent. of water, it will be seen that the amounts of water taken by the two sets were closely alike:—

	1st set lb.	2nd set lb.
Water from swedes	51	31·2
„ drunk	39·2	57·7
	90·2	88·9

and, similarly, the dry matter from the chaff and swedes in both cases was alike:—

	1st set lb.	2nd set lb.
Dry matter (chaff)	14·3	16·2
„ from swedes	5·6	3·4
	19·9	19·6

The cake and corn being the same in the case of each set, this would not alter the relation. It thus appears, as has been noted in previous experiments, that if less roots be given, the balance of water is made up by the animals drinking more water direct, and the balance of dry matter by their eating more chaff.

Coming next to the individual bullocks, soon after the experiment began it was noticed that two of the bullocks in the *heavy* root-feeding set (both of these being in the boxes) did not feed well. One of them (No. 3) would take nothing like the quantity of roots that his fellows did, and, consequently, his food was weighed to him separately. Though he continued in his place, yet, during February and early March, he took less and less roots, the quantity dwindling down to 16 lb. and 14 lb. of swedes per day, and he had, of course, to be thrown out of the experiment. On being slaughtered, he was found to be very unsound, the intestines being all grown together. A second bullock (No. 1), though apparently doing well at first, dropped in February his amount of roots from 50 and 56 lb. per day to 30 lb. or so, and then refused to eat. A veterinary surgeon was called in, but the bullock, though recovering for a time, lapsed back, and would only eat a little long hay with cake, but refused both roots and barley altogether. After a time he picked up. When slaughtered, he, too, was found to be unsound in the liver, this being grown on to the diaphragm. He was, therefore, also thrown out of the experiment. Yet a third bullock (No. 4) of the heavy root-feeding set did not appear to have the capacity of taking the larger quantity of roots. But, as the quantity he took daily never fell below 50 lb., and remained towards the close at 56 lb., and as, on being slaughtered, he proved to be perfectly sound and his carcass one of the best of all, he was included in the experiment.

With the light root-feeding animals there was no difficulty whatever, all eight keeping well throughout and eating their allotted foods perfectly satisfactorily.

This experience would seem to point to there being—with cer-

tain animals, at least—variations in their capacity for consuming even what would be generally considered *moderate* amounts of roots. It is clear also, that, whatever may be said about the root-consuming powers of bullocks in other parts of the country, here, at all events, and with Shorthorn bullocks, the quantity of roots could not well be carried beyond 56 lb. a head daily. Even then it was doubtful if, independent of other and unconnected ailments, the bullocks receiving the larger amounts of roots continued as well in health throughout as those whose supply of roots was limited. Comparing these facts with those observed in 1895–96, when Herefords were used in place of Shorthorns, it will be seen that the substitution of the latter caused only about 6 lb. more roots per head per day to be consumed. The Shorthorns, further, ate from $1\frac{1}{2}$ to 2lb. more chaff per head daily than the Hereford bullocks had done.

The experiment, after elimination of the two bullocks that were unsound, resolved itself into one set of six bullocks (two each in boxes, shed and yard) feeding on *heavy* roots, against a second set of eight bullocks (four in boxes, two in shed, and two in yard) on *light* root-feeding.

The bullocks were all weighed at starting, on December 4, 1896, about 10 A.M., having received, first thing in the morning, only a *limited* amount of food, viz. 2 lb. of cake and corn, 5 lb. of chaff, and 12 lb. of swedes per head. In subsequent weighings the same precautions with regard to a limited ration on the morning of weighing were observed. These subsequent weighings were taken on January 28 (*i.e.* after 55 days) and March 22 (after 53 days more) for all the animals alike. On March 7, Mr. J. P. Terry (a member of the Council and of the Woburn Committee) kindly visited the farm and carefully examined the bullocks, with a view to deciding when the several animals should be killed and the experiment be concluded. As the result of his inspection, he found that all four bullocks that had been feeding in the shed, as also three of those in the open yard, and one only of those in the boxes, would be ready to kill about March 20. Of these eight animals, four had been having the heavy root-feeding and four the light.

It was somewhat remarkable that one only of the bullocks out of the feeding-boxes was considered ready to kill, while the others were, with one exception, nearly fat. It might be explained here that, up to 1897, bullocks feeding in the boxes have been isolated from one another by partition-walls in each box, and it has been the opinion of some practical men that this isolation—the animals being able to hear, but not to see one another—has tended to make them restless and not settle down so quietly as otherwise, or to feed as well. The difference has, I must say, not been clearly marked in previous experiments; but still, where an advantage has been shown, it has been, I must allow, in favour of the shed or the open yard. This year, however, there certainly seemed more than a chance variation, and, acting on suggestions made by Mr. Terry and Mr. Ryland (members of the Woburn Committee), the feeding-boxes have since been altered by the taking out of a large part of

the dividing-wall between adjoining boxes, and the insertion of bars, so that each animal can now see his immediate neighbour.

Arrangements were made for the disposal of the animals, and these, inasmuch as the recording of the carcass weight of each bullock and the simultaneous slaughtering of a number of animals were necessitated, involved considerable trouble. It is well known that it is not an easy matter to dispose of even eight or ten bullocks to be killed at one time and at the same place, and, as a consequence of this and the extra trouble involved in keeping each carcass separate and weighing it at the proper time, the full market price can never be realised by us; added to which, excessive carriage has often to be paid to some far-distant place. But the recording of the actual carcass weights is an absolute necessity to the attainment of reliable conclusions from the feeding, and, hence, monetary returns and expenses have to be of subsidiary concern. It is only right, however, to bear these circumstances in mind, and to allow for them, reckoning the returns rather on the current market price of the day than on the price actually given.

Thus, on March 20, when eight bullocks were ready to go, no local butcher would take such a number under our conditions, and they were purchased by a dealer who undertook to get them all killed in one day. Hastings, it turned out, was their destination, and the purchaser paid all expenses of carriage, &c., giving 4*s.* per stone dead weight for the animals, the current market price at the time for this class of animal being 4*s.* 4*d.* per stone. On hearing that the first eight beasts were to go to Hastings to be killed, they were weighed at 10 A.M. on March 22, after *limited* feeding; they were then allowed just enough food to make up, with the limited diet, the amount of food that they would under ordinary circumstances have received up to 10 A.M. (the time of weighing); but, after this, no more food or water was given them, and they were, accordingly, fasted until 10 A.M. the following morning (March 23), when their *fasted* live weights were taken at the farm. They were then despatched to Hastings, Mr. Forrester, the farm manager, proceeding there likewise; and in his presence the bullocks were killed on March 24, between 12.30 P.M. and 4 P.M. The carcass weights were taken by Mr. Forrester on March 25 at 6 A.M.

As regards the remaining eight bullocks, four of these (two on the heavy root-feeding and two on the light) were ready on April 13, and were sold to a butcher at Aylesbury under like conditions to the previous eight, but at the increased price of 4*s.* 2*d.* per stone, the better price being obtainable, probably, on account of there being four bullocks only instead of eight to dispose of at one time. The market price was then 4*s.* 4*d.* per stone as before. Of these four bullocks, one was the remaining animal out of the yard lot, and three others out of the boxes (one on heavy root-feeding and two on light). The live weights on the farm were taken on April 13, the fasted live weights on April 14, and the carcass weights on April 15, all with the same precautions as before described.

There remained now two bullocks only—both from the boxes, on the light root-feeding—and these were ready to go on April 27, when they were weighed, weighed again (fasted) on April 28, and the carcass weights taken April 29. They went to the same purchaser at Aylesbury as before, and at the same price.

Taking into consideration the prices actually given for the different carcasses, and the peculiar circumstances of the case, it would be only fair to reckon the returns on the basis of the then current market price, viz. 4*s.* 4*d.* per stone.

Table III., p. 180, gives the particulars concerning the live weights of the bullocks at the different periods of weighing, the fasted weights, carcass weights, and the respective gains.

This table brings out several points f interest. In the first place, it would appear that the bullocks in the shed and in the yard fattened more quickly than in the boxes alike when heavy or light root-feeding was given. At the same time, the slower increase in live weight of the box-fed animals resulted ultimately in much better carcass weight and more satisfactory percentage of carcass to fasted weight.

On the whole, the gain with the heavy root-feeding was more rapid and the total increase larger than with the lighter root-feeding, but the slower feeding gave the better carcasses. The lesser amount of roots seemed to do better in the case of the yard-fed and shed-kept animals than in the boxes.

Collecting now together the various items that enter into consideration of the respective returns obtained, we have, firstly, as the average per bullock:—

—	Average weight per head					Price obtained per head		
	st	lb		s	d	£	s	d
Set I. (Heavy root-feeding)	100	$5\frac{1}{3}$	at	4	4	21	16	$2\frac{1}{4}$
„ II. (Light „)	100	$2\frac{7}{8}$	„	4	4	21	14	$10\frac{3}{4}$
Difference per head in favour of heavy root-feeding						.	1	$3\frac{1}{2}$

The next consideration is the relative amounts of foods consumed by the two sets. During the entire period required to fatten off the six bullocks on the heavy root diet and the eight bullocks on the light root diet, the average amounts of food consumed per bullock were as follows :—

	Heavy root-feeding.				Light root-feeding.			
	tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb.
Linseed cake . . .	0	2	3	0	0	2	3	$20\frac{1}{2}$
Decorticated cotton cake .	0	2	3	0	0	2	3	$20\frac{1}{2}$
Barley	0	2	3	0	0	2	3	$20\frac{1}{2}$
Oat straw chaff . .	0	2	2	$23\frac{1}{2}$	0	3	0	$6\frac{3}{4}$
Wheat straw chaff . .	0	0	3	$11\frac{1}{2}$	0	1	0	$3\frac{1}{4}$
Meadow hay . . .	0	9	3	$10\frac{1}{2}$	0	11	1	$9\frac{3}{4}$
Clover hay . . .	0	0	3	17	0	2	0	$4\frac{1}{2}$
Swedes	2	17	0	10	1	16	3	21
Water	1	18	3	26	3	1	1	9

TABLE III.—*Table giving the Live Weights of the Bullocks at each Period, the Gains in Live Weight, the Fasted Live Weights, and the Carcass Weights.*

SET I.—BULLOCKS ON *HEAVY* ROOT-FEEDING.

—	No.	Live weights: Dec. 4, 1896	Jan. 28, 1897	March 22	April 13	April 27	Gain in live weight: In 55 days	In 53 days	In 21 days	In 35 days	In total period	Total number of days fattening	Average gain per day	Fasted live weight	Carcass weight in stones (8 lb. to stone)	Percentage of carcass to fasted weight
		c. q. lb.	c. q. lb.	c. q. lb.	c. q. lb.	c. q. lb.	lb.	lb.	lb.	lb.	lb.		lb.	c. q. lb.	st. lb.	
In Boxes [1]	2	11 1 9	12 1 10	13 1 2	—	—	113	104	—	—	217	108	2·01	12 3 0	107 4	60·50
	4	10 2 16	11 2 20	12 2 16	12 3 21	—	116	108	33	—	257	129	1·99	12 1 9	105 2	60·97
In Shed	9	10 2 8	11 2 6	12 2 2	—	—	110	108	—	—	218	108	2·02	11 2 16	94 4	57·36
	10	10 0 10	11 0 15	12 0 12	—	—	117	109	—	—	226	108	2·09	11 1 18	92 0	57·67
In Yard	13	11 2 24	12 3 4	13 3 9	—	—	120	117	—	—	237	108	2·19	13 1 0	106 7	57·61
	14	9 3 4	11 0 2	11 3 20	12 0 9	—	138	102	17	—	257	129	1·99	11 2 7	98 7	61·08
Total of six bullocks	—	64 0 15	70 2 1	76 1 5	—	—	714	648	50	—	1,412	690	—	72 3 22	604 0	—
Average per bullock	—	10 2 21⅙	11 3 0	12 2 24	—	—	119	108	—	—	235⅓	115	2·05	12 0 17	100 5⅓	59·14

SET II.—BULLOCKS ON *LIGHT* ROOT-FEEDING.

—	No.	Dec. 4, 1896	Jan. 28, 1897	March 22	April 13	April 27	In 55 days	In 53 days	In 21 days	In 35 days	In total period	Total number of days fattening	Average gain per day	Fasted live weight	Carcass weight in stones	Percentage of carcass to fasted weight
In Boxes	5	11 0 24	11 2 20	12 2 0	12 3 22	—	52	92	50	—	194	129	1·50	12 1 24	109 4	62·75
	6	11 0 6	12 0 0	12 3 20	—	13 1 0	106	104	—	56	266	143	1·86	12 2 10	105 6	60·00
	7	11 0 0	11 3 20	12 2 19	12 2 14	—	104	83	loss—5	—	182	129	1·41	12 0 8	104 4	61·53
	8	10 1 14	11 0 11	12 0 1	—	12 2 7	81	102	—	62	245	143	1·71	11 3 24	100 6	60·30
In Shed	11	10 2 3	11 1 1	12 1 14	—	—	82	125	—	—	207	108	1·92	11 2 14	95 3	58·60
	12	10 0 10	11 0 1	12 0 7	—	—	103	118	—	—	221	108	2·05	11 1 4	90 5	57·36
In Yard	15	10 3 6	12 1 1	12 2 25	—	—	163	52	—	—	215	108	1·99	12 0 8	96 4	57·10
	16	10 2 19	12 0 6	12 3 11	—	—	155	92	—	—	247	108	2·29	12 0 16	99 7	55·75
Total of eight bullocks	—	85 2 26	93 1 4	100 0 16	—	—	846	763	45	118	1,777	976	—	96 0 21	802 7	—
Average per bullock	—	10 2 24	11 2 18	12 2 2	—	—	105¾	96	—	—	222⅛	122	1·82	12 0 3	100 2⅞	59·60

	In 55 days	In 53 days	In 21 days	In 35 days	In total period
Gain per head daily: SET I. (heavy root-feeding)	2·18	2·04	—	—	2·05
" " " " II. (light ")	1·93	1·81	—	—	1·82

[1] Nos. 1 and 3 were thrown out of the experiment.

From this it will be seen that each bullock on the heavy root-feeding consumed during the whole period of experiment, as compared with each light root-fed bullock,

tons	cwt.	qr.	lb		s.	d
1	0	0	17	more swedes, costing, at 7s. per ton . .	7	0

The light root-fed bullocks, on the other hand, consumed per head the following amounts of food over and above what the heavy root-fed ones took per head :—

	cwt.	qr.	lb.		s.	d.
Linseed cake	0	0	$20\frac{1}{2}$	costing	1	5
Decorticated cotton cake .	0	0	$20\frac{1}{2}$	”	1	2
Barley	0	0	$20\frac{1}{2}$	”	0	$11\frac{1}{4}$
Oat straw chaff . . .	0	1	$11\frac{1}{4}$	”	0	$7\frac{1}{2}$
Wheat straw chaff . .	0	0	$16\frac{1}{4}$	”	0	$2\frac{1}{2}$
Meadow hay	1	1	$27\frac{1}{4}$	”	4	6
Clover hay	1	0	$15\frac{1}{2}$	”	4	3
					13	$1\frac{1}{4}$

Setting against this the extra amount of roots consumed by the heavy root-feeding bullocks, we have, per head—

	s.	d.
Cost of extra cake, corn and chaff consumed by light root-feeding set	13	$1\frac{1}{4}$
Less cost of extra roots consumed by heavy root-feeding set	7	0
Extra cost per head of light root-feeding	6	$1\frac{1}{4}$
Extra price per head realised by heavy root-fed bullocks	1	$3\frac{3}{4}$
Total gain by heavy root-feeding per head	7	5

If, lastly, we take into account the difference of value of the manure left in the two cases, we shall have a slight balance in favour of the manure made by the light root-feeding. On the one hand is the manurial value of the extra ton of roots consumed per head by the heavy root-feeding set, amounting to about 2*s.* 3*d.*, and, on the other hand, the manurial value of the extra amounts of linseed cake (say 6*d.*), decorticated cotton cake (say 8*d.*), barley (say 1*d.*), oat straw (say 1*d.*), meadow hay (say 11*d.*), and clover hay (say 1*s.* 4*d.*), altogether about 3*s.* 7*d.*, consumed per head by the light root-feeding set, giving, in all, a difference in manurial value of 1*s.* 4*d.* in favour of the manure from the light root-feeding.

This, deducted from the gain of 7*s.* 5*d.* when the cost of feeding alone is considered, gives, in the end, the following:—

	Heavy root-feeding s.	d.
Gain per head in price realised	1	$3\frac{3}{4}$
Gain per head through lesser cost of feeding . .	6	$1\frac{1}{4}$
	7	5
Less reduction in manure value	1	4
Total gain per head through heavy root-feeding .	6	1

There is, therefore, a small difference in favour of the heavy feeding with roots. This difference, though not large, is considerably more than was found the year before, when Herefords were used instead of Shorthorns, and the two years' experiments may, accordingly, be taken together as showing, generally, that when roots are plentiful it does rather better to use them in moderate amount, say up to 60 lb. per head daily, than to limit them to, say, 35 lb. per head daily, and make up with hay and chaff; but that, on the other hand, if there is a short crop of roots, bullocks will be very little the worse by cutting down the daily supply of roots and giving them the additional dry matter (that the roots would contain) in the form of hay and chaff, and supplying them with more water to drink.

It may be of interest to practical men to state the financial result of the feeding with the heavy root diet. It was as follows:—

	£	s.	d.
Gross profit per head (difference between purchase price and selling price)	7	6	2½
Cost of food and attendance per head	6	0	0
Net profit per head	1	6	2½

leaving out of account, on the one hand, the cost of the litter, and on the other, the value of the manure produced.

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Notes, Communications, and Reviews.

A ROTATION OF CROPS FOR LIGHT CHALK SOILS.

A common rotation on the lighter lands of East Kent ten or fifteen years ago was: wheat (on clover-ley), barley, pulse or green-crop, wheat, oats, turnips, barley, clover. Most of the manure being put on clover-ley for wheat, this rotation was no doubt a good one, where the object was first of all to grow wheat, and secondly malting barley, on land which would only carry clover once in seven years. When, however, the fall in prices reduced wheat to the position of a by-product—grown on many farms chiefly for the straw, and as a preparation for barley—the theory of production on which this and similar rotations were built up had to be altered. At the same time, owing to the scarcity of tenants, lease restrictions were relaxed, and the sale of straw was sometimes allowed. This changed "the value of farm-yard manure" from a chemical problem into a practical question. I do not discuss it in the abstract; there will always be a certain amount of manure made by horses, pigs, and milch cows. Here there is no question of value; the manure is a by-product and must be used. It is after this that the difficulty begins. A man has, let us say, 20 tons of wheat-straw, and the question is whether he shall buy beasts to "tread it down," or whether he shall sell it?

In the former case he will get about 70 tons of manure—enough for a moderate dressing on seven acres of land. In the latter he will (with rather less labour of men and horses) cart it into the nearest town, where it will fetch at least 45*s.* a ton. I say "with less labour," and I think this is certainly the case, if we reckon the time of men and horses carrying a ton of straw into the yard, taking out four tons of manure, carting this to a heap, turning, re-carting three and a half tons to the field, setting out the heaps, and spreading, against the tying up and carrying to market of one ton of straw. It must be remembered that I am speaking of the south-east of England, where towns are fairly plentiful, and straw is rather scarce. Besides the straw, we must probably debit our 70 tons of manure with about 25 tons of roots, which are worth

3*s.* a ton to feed in the field, *i.e.* 4*s.* 6*d.* a ton in the yard; and also with attendance on the bullocks, since if these latter pay for corn, cake, hay, interest, and risk of loss, it is generally considered that they have done pretty well. Here then we have the case of a farmer called upon to decide whether he shall manure seven acres of ground moderately well, or whether he shall put 50*l.* into his pocket. On what possible supposition can it pay him to spend 7*l.* an acre in manuring for any farm crop at present prices? This is no fancy case put to prove a theory. It is a question which comes before us, who farm land of this class, every autumn. On the one hand we have a buyer asking us for straw, on the other a dealer offering us bullocks. Which are we to take?

This, it will be said, is the tenant's point of view, but how about the landlord, or the man who farms his own ground? Will not the soil gradually deteriorate under this treatment? All light land farmers will tell us so. The mere loss of plant-food in the straw is no doubt small and easily replaced; it is in physical condition that the ground suffers, because we do not keep up the supply of humus. This brings us back to the new rotations. It is here that we hope they will help us. What is the present method of breaking up a grass or sainfoin ley? First, perhaps, a corn-crop; then the ground would be cleaned at considerable expense, ploughed, broadshared, harrowed, and the couch forked out and burnt. Having thus removed most of the vegetable matter in the soil, we of course have to replenish it with farm-yard manure. A rotation which would spare us the cost of cleaning, and the still greater expense of manuring, would I think make the whole difference in the profit, or indeed the possibility of cultivating light lands at the present time. Two objections at once occur to us: (1) Will the ground really be kept clean? (2) What about wire-worm? Lord Leicester tells us that under his rotation one green crop, such as rape, effectually cleans his land after six or seven years' ley. Probably the Norfolk land does not run to grass so much as ours does on the south-eastern chalk. I confess that I have rarely found one year's cleaning (unless it was almost a bare fallow) effectual after an old ley. Wire-worm also in our experience is very much worse in the second year after a ley is broken up, than in the first.

I believe that the harm done to a corn crop by wire-worm depends more than is generally supposed on the amount of extraneous vegetable matter in the soil. I have put in corn upon old leys which were choked with couch and creeping bent, and never had any serious trouble—none that could not easily be suppressed by harrowing and rolling. But on three occasions—once the second year after an old ley, when the couch had been forked out, and twice after (*a*) grass, and (*b*) sainfoin, three years old, which were remarkably clear of any creeping roots—the "worm" quite beat us, and destroyed half the crop, in spite of rape-cake, nitrate of soda, &c. It seems probable that the roots of couch, when present, take off their attention from the corn like the slices of wurzel which we bury in

hop-hills for the same purpose. If this is so, it is an additional reason for making weed-grasses rot, if possible, in the soil instead of removing them. But apart from this, no one, I think, who has tried to grow corn on light land in a dry climate will question the enormous value of a good supply of humus in the soil. Three seasons out of four in the eastern counties there comes a time, it may be only for two or three weeks, when plant growth is checked by want of water. This is not of so much consequence with wheat, but barley, the main crop of the lighter soils, is both shallower-rooted and more delicate in constitution, and one such check will seriously affect the sample for malting purposes. We want the ground to hold water like a sponge, instead of like a bed of sand, which is either water-logged or too dry. This of course can only be done by filling it with decaying vegetation. To take an extreme case—in the drought of 1893 old turf full of couch roots gave us better crops than clean land.

I think that a modification of Lord Leicester's rotation,[1] after grass or sainfoin ley—viz.: 1st year, vetches fed off, followed by mustard ploughed in; 2nd year, rape fed off; 3rd, wheat; 4th, barley—would give a crop of wheat and one of good malting barley at the least possible expense; and after two years' green crop the corn would be pretty safe from wire-worm. The ley should be fed down in winter by in-lamb ewes, eating chaff, corn, and a few roots; ploughed and sown with vetches in February and March; the vetches fed off, ploughed again or broadshared, and mustard sown in June and July, and ploughed in in the autumn. The next spring two turns with the cultivator and one ploughing should clean the land for rape, to be sown with two cwt. of superphosphate, and fed off in August, September, and October. The expenses of these two years would be about as follows:—

	£	s.	d.
4 ploughings	1	15	0
2 cultivatings	0	5	0
8 harrowings	0	8	0
vetch, rape, and mustard-seed	1	0	0
2 cwt. superphosphate	0	6	0
sowing seed and manure	0	6	0
	4	0	0

Against that we have two crops (one of vetches and one of rape) to feed off, say 3*l*, so that there is only about 1*l*. to be debited to the two corn crops. Rent and rates for two years on land of this class would amount to about 1*l*. 10*s*., making the total cost of preparing for wheat and barley 2*l*. 10*s*. an acre. Mr. Elliot, in his very interesting paper[2] recently published in the Journal, advocates the same rotation as Lord Leicester, *i.e.* grass, green-crop, corn,

[1] See Journal R.A.S.E., 3rd series, vol. vii., 1896, p. 166.

[2] *The Value of Plant Roots as Tillers of the Soil*, by Robert H. Elliot, Journal R.A.S.E., 3rd series, vol. viii., 1897, p. 467.

green-crop, corn, and grass again. I believe the common course in the south of Scotland is grass (two or three years), oats, turnips, oats, grass again; and no doubt the insertion of a green-crop after the grass would improve the condition of the land. But I think on our soils it will be better to take the two green-crops together, as I have suggested. Mr. Elliot's country is not much troubled, I think, by either couch or wire-worm. At least the rotation of grass, corn, roots, corn, grass, which I know is successful there, would be impossible with us. Moreover our chief object is to grow a good sample of malting barley, and this is best done on a wheat stubble. The Wiltshire rotation—swedes, rape, wheat, barley—is known to give excellent results, and the one which I propose closely approximates to it. The vetch crop, moreover, will accumulate nitrogen, and the ploughing in, first of the grass or sainfoin, and secondly of the mustard, will greatly increase the supply of humus in the soil, and help to bring about that physical condition on which Mr. Elliot (rightly as I believe) lays such stress. It may be objected that this course only provides sheep food till November, and would necessitate selling all our lambs before Christmas. This may of course be done, but it must be remembered that I only contemplate cropping thus on part of the holding. On almost every chalk farm we find in the valley, and probably close to the buildings, a bed of loam capable of growing good crops of swedes and wurzel. There is no trouble about this land; the difficulty is with the thin chalk slopes and the far-off fields, and it is for these that I advocate, and am myself trying, the new rotation.

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THE RATING OF GLASSHOUSES OVER MARKET GARDENS UNDER THE AGRICULTURAL RATES ACT, 1896.

SINCE the case relating to the Rating of Glasshouses over Market Gardens under the Agricultural Rates Act, 1896, was reported in the last number of the Journal (3rd ser., vol. viii., 1897, part iv. pp. 770–774), it has been carried by the Surveyor of Taxes to the Court of Appeal, and this Court, after having taken some time to consider the case, was divided in opinion, as the Court below was. The Master of the Rolls (Sir Nathaniel Lindley) and Lord Justice Rigby agreed with Mr. Justice Ridley in the Court below, while Lord Justice Vaughan Williams agreed with Mr. Justice Collins. But as two Judges of the Appeal Court were in favour of the appeal, while only one was against it, the appeal was allowed, with the result that the glasshouses have to be rated like other buildings.

The arguments put forward by the *Attorney-General* for the appeal, and by *Mr. Joseph Walton* against it, were practically the

same as had been used by them respectively in the Court below, and the reasons given in the judgments of the Master of the Rolls and Lord Justice Rigby for allowing the appeal were much the same as the reasons given by Mr. Justice Ridley in the Court below, while Lord Justice Vaughan Williams's reasons were much the same as those of Mr. Justice Collins. It is curious that, as Mr. Justice Collins has become an Appeal Judge since he gave his judgment, two present Appeal Judges are of opinion that the Act relieves market gardens covered with glasshouses from half of the rates, while two other Appeal Judges are of opinion that it renders them liable to whole rates. It is stated that the case is to be carried to the House of Lords, but it would seem only reasonable that, where Judges of so high a Court as the Court of Appeal are so equally divided in opinion, Parliament should, by a short Amendment Act, settie the question once and for all.

S. B. L. Druce.

Lincoln's Inn.

INDEX NUMBERS OF THE PRICES OF COMMODITIES IN 1897.

The subjoined letter from Mr. A. Sauerbeck appeared in *The Times* of January 14, 1898. The term "index number" was defined in the Journal[1] in 1893. The Journal for 1897 (3rd series, vol. viii., Part I. p. 169) contained the index numbers for 1896.

"The following are the annual index numbers of the prices of forty-five commodities, the average of the eleven years 1867–77 being 100:—

1878–87	79	1890	72	1895	62
1888–97	67	1891	72	1896	61
1880	88	1892	68	1897	62
1888	70	1893	68		
1889	72	1894	63		

"The index number for last year is one point better than that for the preceding year, or the same as in 1895. As the low figure of 1896 was mainly caused by unprecedentedly low prices, in the aggregate, of articles of food, so the number of 1897 was principally affected by the opposite course, higher prices of food, while the average of all materials was the lowest on record. Amongst the articles of the first class, wheat, barley, oats, potatoes, rice, and all sorts of meat, and particularly pork, were higher; but sugar, coffee, and tea declined and ruled, on the average, lower than ever before. In the case of materials there was a moderate improvement for copper, tin, lead, and coals, but all textiles—cotton and wool, flax, hemp, and jute—and a number of sundry materials—viz. tallow, linseed oil, petroleum, nitrate, and indigo—ruled lower.

[1] *See Prices of Commodities during the last Seven Years* (1886–92). By Augustus Sauerbeck. Journal R.A.S.E., 3rd series, vol. iv, 1893, pp. 394–404.

"Timber and soda, on the other hand, were higher. The monthly fluctuations were thus :—

1889. December . 73·7	1896. July . . . 59·2	1897. July . . . 61·7
1890. December . 71·1	1896. December . 62·0	1897. August . 63·2
1891. December . 71·4	1897. January . 62·0	1897. September 63·4
1892. December . 67·7	1897. February . 61·9	1897. October . 62·7
1893. December . 67·0	1897. March . . 61·9	1897. November . 62·4
1894. December . 60·1	1897. April . . 61·5	1897. December . 62·4
1895. February . 60·0	1897. May. . . 61·2	
1895. December . 61·2	1897. June . . 61·3	

"The index number at the end of the year was still a little higher than at the end of the three preceding years.

"Taking articles of food and materials separately the index numbers compare thus :—

——	Feb.	Dec. 1895	July	Dec. 1896	May	Sept.	Dec. 1897
Food . . .	63·8	60·4	60·0	63·9	63·7	67·5	66·5
Materials . .	57·0	61·8	58·6	60·6	59·4	60·4	59·4

"The course of prices during last year was strongly influenced by the rise of wheat in the second half and by the fall of cotton in the last quarter. While articles of food stand still 4 per cent. higher than in December, 1896, and 11 per cent. above the lowest point in July, 1896, materials are 2 per cent. lower than a year ago, but still 4 per cent. higher than at the lowest period in February, 1895.

"Ten descriptions out of forty-five contained in my tables showed records of lowest prices—viz. sugar (two descriptions), flax, Manila hemp, jute, tallow, linseed oil, and nitrate the lowest of the century, and Brazil coffee and indigo the lowest since 1852.

"The average price of silver was 27$\frac{9}{16}$*d.* per oz., the lowest on record, against 30$\frac{3}{4}$*d.* in 1896. It stood at 29$\frac{13}{16}$*d.* at the end of 1896, sold at 29$\frac{3}{4}$*d.* in January and February, and gradually declined to about 26$\frac{1}{2}$*d.* in July. In August it suffered a sharp decline, touched 23$\frac{3}{4}$*d.*, the lowest price ever known, but soon recovered, and realised on the average about 26$\frac{3}{4}$*d.* during the last three months, the closing price of the year being 26$\frac{3}{8}$*d.* per oz. The index numbers were as follows (60·84*d.* per oz. being the parity of 15$\frac{1}{2}$ silver to 1 gold=100) :—

Average 1896 . . .	50·5	End of 1896 . . .	49·0
„ 1897 . . .	45·3	„ 1897 . . .	43·8

"Owing to the introduction of the gold standard in Japan the export to that country was entirely stopped, but there was a good demand for India, and, as in the previous year, silver was strongly favoured by the Russian currency requirements. It appears that fully one-third of the world's total production was taken for that purpose. A year ago, and again in September, I called attention to this great demand, and it may be useful to inquire how much silver will really be required by Russia. It is the intention to replace all

one and three rouble notes by silver, and as of these 233,000,000 roubles were issued, it would at 18 grammes fine silver require 4,200,000 kilos., or 146,000,000 oz. standard. It is difficult to know the exact amount actually taken, as the complete Russian statistics are not to hand, but I estimate that the net quantity during the last three years, after allowing for industrial consumption, reached about 2,700,000 kilos. fine, equal to 94,000,000 oz. standard, or 150,000,000 roubles. As it is reported that only 106,000,000 roubles have so far been coined, there must be a considerable stock of silver on hand, while the quantity still to be purchased would on this basis amount to about 52,000,000 oz. standard, equal to about 30 per cent. of one year's production of the world. It is assumed in this calculation that the quantity of old silver coin in Russia will be sufficient for small coins.

"With regard to the general state of trade in Europe during the past year opinions appear to differ, but I believe there is plenty of evidence that the result was, on the whole, less favourable than that of 1896 and the second half of 1895. The famine in India and the outbreak of plague seriously impeded the trade with this great dependency, and there was also a considerable reduction in the exports to the Far East, to Australia, and South America. The change in the tariff of the United States, while stimulating exports there during the first half of the year, caused a complete stoppage of demand later on. The textile industry, particularly of cotton and wool, was very depressed, and though the good demand for iron and other metals continued throughout the year, the engineering trade in this country was greatly hampered by the protracted strike. The harvest on the Continent was bad, causing a rise in the prices of breadstuffs, while large sugar crops and unprecedented crops of American cotton and Brazil coffee had a depressing influence on these articles.

"In the United States, on the other hand, things were much better. Prices of wheat were already good last winter, and in view of a protective tariff there was considerable speculation in raw materials and manufactures, to be followed in the latter part of the year by the fortunate coincidence of a good harvest and high prices of wheat. The exports show again, as in the previous year, an enormous excess over the imports, about \$350,000,000, and this must soon increase the demand for foreign goods again, notwithstanding the high duties. The settlement of the currency makes, unfortunately, no progress, although with a little goodwill and only a moderate amount of gold it could be placed in a sound position.

"The future of prices of raw materials will depend on the American demand and on any improvement in the condition of the East and of other extra-European countries, which, in my opinion, cannot be very far distant, but the general index number may be affected by any weakening in the now exceptional prices of wheat, and this must occur as soon as larger quantities are again brought to market."

M. MÉLINE ON THE DECLINE IN PRICES OF AGRICULTURAL PRODUCE IN FRANCE.[1]

WOOL which was worth in 1882 from 1 fr. 85 c. to 2 fr. 5 c. is worth in 1897 no more than 1 fr. 8 c. to 1 fr. 25 c. Raw cocoons worth in 1882 from 4 fr. 70 c. to 4 fr. 45 c. are in 1897 worth no more than 2 fr. 50c. to 2 fr. 95 c. Tallow worth 95 fr. in 1882 is worth only 42 fr. in 1897. Alcohols (of 90 deg. strength) worth 59 fr. in 1882 are worth only 38 fr. in 1897. White sugars which were worth 36 fr. now command only 25 fr.; starches, of first quality, which were worth 32 to 34 fr. are now only worth 27 to 28 fr.; vinegars which fetched 38 to 40 fr. now sell for 30 to 35 fr. Butter was worth 3 fr. 35 c. to 3 fr. 50 c., but it is now worth not more than 1 fr. 80 c. to 1 fr. 90 c. For wheat, taking the averages of five-year periods since 1877, it appears that for 1877 to 1881 the price of the quintal was 29 fr. 39 c.; for 1882–1886 it fell to 24 fr. 3 c.; for 1887–1891 it was 24 fr. 86 c.; and for 1892–1896 it was only 20 fr. 53 c. The decline in the value of agricultural produce in France has thus been general.

THE WINTER OF 1897–98.

TAKEN as a whole, the recent autumn and winter seasons have been quite as remarkable as any we have had for very many years past. Owing to the warmth and dryness of the former season, autumn sowing and farm operations generally were carried on with scarcely a break, and at a very early period in the winter the crops, so favourably started, were showing well and vigorously above the ground. In December there were two cold snaps—one at the beginning of the month and the other just about Christmas-time, but with these exceptions the weather continued unduly mild, the rainfall being somewhat heavy, but not sufficiently so to do any material harm. In January the conditions were still more unusual, an absence of anything like severe frost being reported in all parts of the country. Towards the end of the month the midday temperatures were on several occasions quite exceptional for the time of year, the month as a whole being in the south one of the mildest, and in the north the very mildest January, on record. Up to the beginning of February it seemed in fact as though the winter would pass with scarcely a taste of seasonable weather, the precocious state of vegetation giving some concern to those who

[1] From a speech of M. Méline, the Premier and Minister of Agriculture in France, delivered in the Chamber of Deputies, November 18 and 20, 1897, and reported in the *Bulletin de la Société des Agriculteurs de France*, December, 1, 1897.

reflected on the danger that might arise from the keen frosts so often experienced in spring. The month had, however, not proceeded far before a spell of north-westerly winds set in, with a little frost and snow in most districts. Later on these conditions were repeated on more than one occasion, the longest and most pronounced spell of wintry weather occurring during the closing week of the season, when some very sharp frosts were experienced, with frequent falls of snow or sleet. Over the country generally the latter came mostly in the form of showers, and in many districts it failed to lie long upon the ground. In the south-west of England, however, including the western part of the southern counties, a severe snowstorm occurred on February 21, the fall in Devonshire and Cornwall being the heaviest experienced there since the memorable blizzard which occurred early in March 1891. Throughout the entire winter the English districts appear to have enjoyed a fair immunity from severe gales, the huge Atlantic cyclones which bring these, and which also occasion our heavy winter rains, keeping as a rule outside our north-western and northern coasts. In these latter regions the weather was quite as stormy as usual, and in the west of Scotland, as well as at many places in the north of Ireland and the north-west of England, the total rainfall was considerably in excess of the average. During the early part of December thunder and lightning were somewhat frequent, the most important case occurring on the 14th, when smart thunderstorms spread from the westward over all the southern parts of Ireland and England. At some places in the south and south-west similar phenomena occurred during the snowstorm of February 21.

The leading features in the weather of the past winter are shown in a statistical form on p. 193, the following remarks giving further details of interest in the history of each particular element.

Temperature.—With the exception of the first week in December, the week ending with Christmas Day, and the last week in February, the mean temperature was above the average, the excess of warmth being very great about the middle of December, the end of that month, and the beginning of the new year, as well as in the third week of January. Taking the winter as a whole the mean temperature was considerably above the average, the departure from the normal being greatest in the southern counties, where it amounted to over three and a half degrees, and least in the Channel Islands, where the excess was little more than two and a half degrees. As a rule the excess of heat was greater in the daytime than at night, this being especially the case in the north-eastern counties, where the departure from the normal was nearly twice as large in the one case as in the other. In the south of England, however, and also in the north-west, the undue mildness was more noticeable by night than by day. A comparison with the records for previous years shows that over England generally the past winter was the mildest since that of 1883–84, prior to which there had not been so open a season since that of 1876–77. The winter of 1883–84 was somewhat milder than that which has just elapsed, while that of 1876–77

was considerably milder. In the north of Scotland, however, the past season was the mildest since that of 1881–82. Over the north-eastern, eastern, and midland counties, the highest temperatures of last winter occurred at the end of January or the beginning of February, when the thermometer rose to between 59° and 61°, the readings at some of the northern stations being the highest on record for so early in the year. In the southern parts of the country, however, the mildest weather occurred about the middle of December, and in the north-western counties at the end of that month, the thermometer in the latter district rising in one or two places to a maximum of 60°. At many of the western and northern stations the highest winter readings were in excess of anything recorded since the season of 1890–91. The latter winter was, it may be remembered, one of the coldest on record, but at the close of February a singular burst of warmth was experienced, the thermometer rising above 60° in nearly all districts, and actually exceeding 65° in a few isolated places. The lowest temperatures of last winter occurred as a rule on either February 21 or 24, when the sheltered thermometer registered from 12° to 15° of frost in many places. In all but the western districts, however, the readings were very nearly as low about Christmas time, while in the midland counties the weather then was quite as cold. Over the country generally the frosts of last winter were less keen than in most recent years, but in the west they were sharper than any experienced during the winter of 1895–96.

Rainfall.—During the earlier half of the winter the rainfall was as a rule in excess of the average, this being especially the case in the western and northern parts of the country. In the second week of December the rains were unusually heavy in all districts. Throughout the latter half of the season the weather was very much drier, scarcely any rain falling over England during the second fortnight in January. The droughty tendency was, in fact, so much more pronounced than the wetness of the earlier part of the season, that in all but the western districts the total rainfall for the winter was much less than the average, the proportion in the northern and eastern counties being less than three-fourths. In the south-west, however, the deficiency was very slight, while in the north-west the total rainfall was 33 per cent. in excess of the average, the actual amount being twice as much as in the southern counties, and nearly three times as much as in the north-eastern and eastern districts. A comparison with previous seasons shows that over the country generally the winter was not so dry as that of 1895–96, and not nearly so dry as that of 1890–91. In many places the winters of 1887–88 and 1888–89 were also drier than last season. The comparative absence of rain in so many recent winters seems to have been not a little remarkable. Over England we have not had a thoroughly wet winter since that of 1882–83, and before that there had not been one since the very mild and rainy season of 1876–77. In so dry a winter as last there were naturally few individual heavy falls of rain. On December 7, however, a consider-

Temperature, Rainfall, *and* **Bright Sunshine** *experienced over* **England** *and* **Wales** *during the Thirteen Weeks ended February* 26, 1898.

(*The Winter Season.*)

Districts	Temperature: Highest observed	Lowest observed	Day temperatures: Mean	Day: Difference from average	Night temperatures: Mean	Night: Difference from average	Day and night temperatures combined: Mean	Combined: Difference from average
	°	°	°	°	°	°	°	°
North-eastern counties . .	60	20	46·6	+4·1	35 8	+2·2	41·2	+3·1
Eastern counties . . .	61	19	46·2	+3·4	35·1	+2·7	40·7	+3·1
Midland " . . .	59	19	46·2	+3 0	35·2	+2 8	40·7	+2·9
Southern " . . .	57	22	47·7	+3·4	38 3	+3·8	43·0	+3·6
North-western counties, including North Wales .	60	17	47·0	+3·0	38 3	+3·1	42 7	+3·1
South-western counties, including South Wales .	58	18	48·7	+2 9	39·4	+2 7	44·1	+2·8
Channel Islands . . .	56	32	51·0	+3·1	43·0	+2·2	47·0	+2 6

Districts	Rainfall: Days with rain: Number	Days with rain: Difference from average	Total fall: Amount	Total fall: Proportion of average amount	Bright Sunshine: Duration: Hours recorded	Duration: Difference from average	Percentage of possible amount: Percentage	Percentage: Difference from average percentage
			ins.	per cent.				
North-eastern counties .	44	−4	4·4	70	144	+11	20	+2
Eastern counties . .	43	−6	4·3	71	163	+ 4	21	0
Midland "	47	0	5·5	78	154	+ 9	20	+1
Southern "	43	−4	6·0	77	181	+24	23	+3
North-western counties, including North Wales	60	+8	12·1	133	153	+34	21	+5
South-western counties, including South Wales	55	+3	11·2	98	187	+10	24	+1
Channel Islands . . .	59	−1	9·0	89	231	+42	29	+5

NOTE.—The above Table is compiled from information given in the Weekly Weather Report of the Meteorological Office. The averages employed are: For Temperature, the records made during the twenty-five years, 1871–95; for Rainy Days, the values for the fifteen years, 1881–95; for Total Rainfall, those for the thirty years, 1866–95; and for Bright Sunshine, those for the fifteen years, 1881–95.

able downpour occurred in the south-west of England, over an inch being recorded in many places, and as much as 1·8 inch at Arlington (North Devon). Between December 26 and 29 many western stations were similarly affected, the largest daily amount reported being 1·6 inch at Llandovery (Caermarthenshire), on the 29th. On January 4 the north-west of England was visited by heavy falls, the largest being 1·6 inch at Stonyhurst. The only other case of any note appears to have occurred on February 21, when the snow and rain combined yielded as much as 1·6 inch at Hurst Castle. Snow fell in many parts of the country between December 1 and 4 and 8 and 12, and also between February 3 and 7 and 18 and 23, but with the exception of the heavy fall already noticed in the south-west on February 21, the quantity was in nearly all cases very small.

Bright Sunshine.—The prevalence of bright sunshine seems to have varied greatly from time to time. In January, and especially in the closing week, the duration was as a rule less than the average. In December and February, however, the tendency was more often in the other direction, the finest week of all being the closing one of the season, when the amount of sunshine was in many places more than twice as much as the normal. Upon the whole the winter was more sunny than usual, the excess being rather considerable in the southern counties and the Channel Islands, as well as in the north-west of England. The undue prevalence of sunshine in the last-mentioned district seems rather anomalous when we remember that in this locality the amount of rain was also considerably in excess of the average. The matter is, however, easily explained. The frequent rains in the north-west were due, as we have already shown, to the movement of cyclonic systems outside the Irish and Scotch coasts. Between the departure of one of these systems, however, and the arrival of the next the sky usually cleared, so that in localities exposed to their influence, the weather, though frequently worse, was often much finer than in other portions of the country, where gloom and mist were experienced with the large anticyclones which spread over us so repeatedly from the Continent. A comparison with previous years shows that over the country generally the amount of bright sunshine last season was considerably in excess of that recorded in the two preceding winters, but very much smaller than in the winters of 1894–95 and 1893–94.

RECENT AGRICULTURAL INVENTIONS.

The subjects of Applications for Patents from Dec. 6, 1897, *to March* 5, 1898.

N.B.—Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application.	Name of Applicant.	Title of Invention.
Year 1897.		
29432	McGregor, A.	Knotter driving and tripping mechanism of sheaf-binding harvesters.
29650	Tarnon, A.	Harvesters for potatoes, &c.
29892	Brodie, J., & anr.	Chaff-cutting machines.
29997	Scott, J.	Rotary cultivators.
30125	Robson, R. F.	Distributing manure, &c.
30380	Hutchinson, W., & others	Grain silos.
30781	Burns, A.	Topping and tailing implement.
30849	Perkins, J. E. S.	Pressing and weighing hay.
30895	Lane, R. H.	Feed rollers for chaff-cutting machines.
Year 1898.		
234	Howard & Gibbs	Tillage implements.
898	Edwards, S.	Chaff-cutting machines.
1028	Andreasen, O. J.	Machines for picking up cut crops.
1316	Redfern, G. F. (*Peacock, Victoria*)	Rotary disc plough.
2157	Richmond & Chandler	Chaff-cutting machines.
2241	Belcher & Do. (Ltd.)	„ „
2315	Saunders, G.	Rubbing bars for threshing machines.
2513	Newmarch, E.	Threshing machines.
2588	Voisey, J.	Preparation for protecting turnip seedlings.
3311	Rabier, A. F.	Agricultural drills.
3416	Maynard, R.	Chaff cutters.
3430	Robinson, T. J.	Spraying potato plants.
4548	Sutcliffe, W.	Separating dust from hay.
4572	Bingham, G. C.	Ploughs.
4573	„ „	Reapers.
4836	Fisher, J.	Mangel and turnip seed planter.
5308	Belcher, D. & ors	Seed-drilling machine.
5411	Gillingham, J.	Feeding chaff-cutting machines.

Stable Utensils and Fittings—Horse-shoes, &c.

Year 1897.		
417	McDonald, M.	Hame hooks and equivalent trace connections.
692	Hibbert, T.	Horse collars.
714	Nunn, J. N.	Coverings for bits.
732	Gooch, A.	Halters.
734	Jeune, E. B.	Stirrup bar.
794	Brown, F. C	Horse-shoes.
799	Wallingford, J. & E. A.	Extending and fixing stirrups.
872	Reynolds, W.	Automatic feeding bag.

No. of Application.	Name of Applicant.	Title of Invention.
Year 1897.		
30015	Schrader, F. A. M.	Horse-shoe calk.
30230	Hill, C. T.	Shaft tugs.
30294	Overton, A. J.	Hames.
30314	Lumsden, J.	Screw plug for roughing horse-shoes.
30415	Goode, H. C.	Combined saddle and dummy rider.
30642	Serbán, L. M.	Horse-shoes.
30664	Shaiffer, H. D.	„
30688	Orr, W. H.	„
Year 1898.		
363	Holt & another	Harness draft straps.
416	Christy, E.	Stirrups.
730	Hibbert, B.	Nosebag.
749	Broadwell, L. W.	„
764	Beach, W. T.	„
806	Martin, E.	Horse-collars.
906	Clarkson, J. E.	Feeding bag trough.
1000	Westaway, J.	Supporting feeding bags.
1003	Clamp, R. H. & C.	Nosebag.
1030	Josephson, E. K.	„
1060	Hill, T. W.	„
1083	Hammersley, T. J. & another	Support for nosebags.
1144	Toller, E. C., & anr.	Nosebag.
1182	Towler, S. C.	„
1271	Morris, C. F.	„
1302	Thomas, E.	„
1354	Aldrich, F. G.	„
1387	Reynolds, W.	Halter to prevent bolting.
1454	Heather, W. G.	Nosebag.
1486	Macdougall, J.	Horse collars.
1542	Dixon, T. A.	Nosebag.
1681	Eaton, E. (*Grace, New Zealand*)	Trace fastener.
1688	Klen, A. W.	Nosebags.
1722	Best, L. C.	„
1730	Wallis, F.	„
1733	Read, A. W.	Apparatus for combing and trimming manes and tails.
1773	Stewart, S. B.	Nosebags.
1834	Carter, J.	Stirrups.
1871	Douglas, W.	Nosebags.
1945	Walker, E.	Automatic nosebags.
1949	Ashton, N., & anr.	Nosebags.
1998	Jessel, R. P.	Combined girth and stirrup leather.
2006	Johnson, S.	Sanitary nosebag.
2122	Garrod, B. A.	Nosebags.
2170	Hayes, A. H.	Nosebag
2201	Loveday, J.	Horse collars.
2377	Fleming, R. A.	Saddle trees.
2414	Baynton, C. W.	Nosebags.
2474	Corker, A. M. & ors.	„
2533	Judd, H. S.	„
2562	Arnott, L. J. M.	„
2598	Lynch, J. T.	„
2651	Dales, A.	Horse-shoe pad.
2704	Kniep, O.	Roughing horse-shoes.

No. of Application.	Name of Applicant.	Title of Invention.
Year 1897.		
3015	LAULY, R. G. .	Nosebag.
3120	HESLOP, J. J., & anr.	Horse-shoes.
3291	ROWE, A. H. .	"
3295	DENMARK, J. .	Nosebags.
3304	MAYHEW, F. W.	Ladies' saddles.
3323	FORRESTER, T. F.	Bits, curb reins, &c.
3340	GODWIN, G. .	Nosebag.
3384	KNIEP, O. . .	Forming calks and clips on horse-shoes.
3403	RANSOM, H. .	Nosebags.
3491	CAIN, W., & HALL, F.	Overboots for horses.
3607	GREGG, J. . .	Horse-shoes.
4182	FROST, T. . .	Boots for horses.
4338	MUSSELL, J. .	Nosebags.
4417	GRAYSHON, J. .	Frost studs.
4477	MCCALLUM, C. .	Nosebags.
4541	GRUB, O. . .	Riding saddles.
4546	HORNSTEINER, R.	Horse-shoe roughing studs.
4555	MACINTOSH, H.	Stirrup.
4602	LATEULERE, A. A.	Controlling restive horses.
4616	PRICE, H. A., & anr.	Nailless horse-shoe.
4682	STENT, J. S, .	Horse-clipping apparatus.
4832	TOWNSEND, J. .	Nosebags.
4877	AUSTIN, C. .	"
5000	BRUNDAGE, E. L.	Horse collars.
5041	KINNEAR, W. R.	Horse-shoes.
5115	ROMANES, J. S., & anr.	"
5229	ROBERTS, A. J., & anr.	"
5335	PEEL, T. . .	Nosebags.

Carts and Carriages.

Year 1897		
30402	SAGE, E. G. .	Locking and unlocking carts and waggons during unloading.
Year 1898.		
2280	HAILSTONE, C.	Tip carts or waggons.
5265	SADGROVE, H. G.	Automatically checking movements of carts, waggons, &c.

Dairy Utensils, &c.

Year 1897.		
29469	BENNETT, T. .	Milk tester.
29971	POCOCK AND ors.	Lids of railway milk churns.
30335	MEREDITH, A. P.	Milk cans.
Year 1898.		
322	BALL, A. . .	Apparatus for cutting cheese.
2230	CUNNINGHAM, J.	Dasher churn.
3825	STONE, W. N. .	Milk churns.
3923	COPELAND, E. .	Composition for preserving milk.
3926	SIGANDO, E. C. .	Sterilising milk.
4319	HOPKINS, W. .	Closing churns.
4604	GALBRAITH, D. R. S. .	Preservation of butter.
5380	FRIERN MANOR DAIRY FARM, LTD.	Milk can.

Poultry and Game, &c., Appliances.

No. of Application.	Name of Applicant.	Title of Invention.
Year 1897.		
30523	Olive, F. B.	Preserving eggs.
30793	Anderson, E. C.	Incubators.
Year 1898.		
68	Minne, J.	Incubators.
145	Healey, J.	Instrument for killing fowls.
184	Thring, K. A.	Poultry coops.
185	" "	"Runs" for turkeys and geese.
1040	Weeks, W.	Packing eggs.
1450	Hartley, T.	New form of preparing food for poultry.
2083	Anderson, E. C.	Foster-mothers.
2356	Townley, F. D.	Accessories of incubators.
2701	Freeman, W. S.	Incubators, &c.
2870	Deerhurst, Visc.	Collapsible poultry house.
4125	Cook, H. J.	Packing cases for eggs.

Miscellaneous.

Year 1897.		
29439	Wilson, R.	Halter or head gear for bulls.
30676	Heck, J.	Sheep shears.
Year 1898.		
211	Busch, J. G.	Feed barns for stock.
386	Tyson, G. H.	Bull rings.
1044	Pike, E. J.	Manger.
2715	Fritwell, O. P.	Apparatus for cleaning the coats of animals.
3129	Hummel, J., & anr.	Marking sheep.
3845	Whitaker, W.	Securing cattle within their stalls.
4681	Hume, W. (*Bentham, Argentine Republic*)	Sheep-shearing machines.

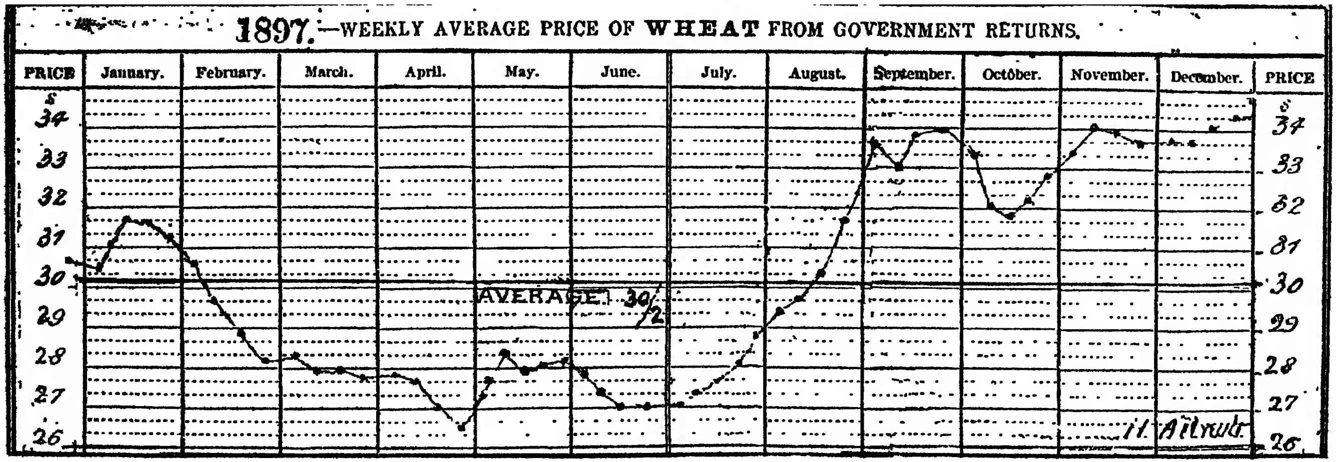
Numbers of Specifications relating to the above subjects published since December 10, 1897.[1]

(Price 8d. each copy.)

Specifications of 1897.

1105, 1259, 1259A, 1512, 1840, 2355, 2407, 2520, 2828, 3152, 3543, 3547, 4636, 5208, 5757, 5969, 6352, 6512, 7002, 7848, 8767, 8846, 9926, 17719, 18163, 18659, 21011, 21248, 22524, 24286, 24324, 25404, 25449, 25506, 26150, 26151, 26637, 26658, 26738, 27521, 27589, 27913, 28025, 28080, 28144, 28451, 28963, 29060, 29447, 29650, 30,015, 30642, 30895.

[1] Copies may be obtained at the Patent Office (Sale and Store Branch), Quality Court, Chancery Lane, London, E.C.



THE PRICE OF ENGLISH CORN IN 1897.

AVERAGES PER IMPERIAL QUARTER FOR 1897.—Wheat, 30*s.* 2*d.*; Barley, 23*s.* 6*d.*; Oats, 16*s.* 11*d.*

(*Each space between the lines of the diagram represents fourpence.*)

THE diagram showing the Imperial average price of *Wheat* in the past year exhibits a rise of 4*s.* a quarter, the average being 30*s.* 2*d.*, whereas in 1896 it was 26*s.* 2*d.* The highest weekly average was 34*s.* 4*d.* on December 25 last, and the lowest 26*s.* 6*d.* on April 24 last, being a fluctuation of 7*s.* 10*d.* a quarter, whereas in 1896 the fluctuation was 11*s.* a quarter. The average price of wheat in 1857 was 56*s.* 4*d.*; in 1867, 64*s.* 5*d.*; in 1877, 56*s.* 9*d.*; in 1887, 32*s.* 6*d.*; in 1897, 30*s.* 2*d.* a quarter. The average price of *Barley* in the past year was 23*s.* 6*d.* a quarter. In 1896 it was 22*s.* 11*d.*, the rise being only 7*d.* a quarter. The highest price was 29*s.* 10*d.* on October 2 last, and the lowest 17*s.* 4*d.* on July 10, a fluctuation of 12*s.* 6*d.* a quarter. In 1896 the fluctuation was 13*s.* 5*d.* The price of barley in the past year has not approached that of wheat, but barley has been below the price of oats for five weeks, viz. on July 10, 17, 24 and 31 and August 7. In the latter week barley was 17*s.* 9*d.* whilst oats, at 18*s.* 11*d.* a quarter, were 1*s.* 2*d.* above barley. The average price of *Oats* in the past year was 16*s.* 11*d.* a quarter, which is 2*s* 2*d.* a quarter higher than in 1896, the average in that year being 14*s.* 9*d.* The highest price was 19*s.* a quarter on July 31, and the lowest 16*s.* on October 9 and 30, being a fluctuation of 3*s.* a quarter. In 1896 it was 4*s.* 6*d.* Willich's tables state that the septennial tithe-rent charge for 1898 will be 68*l.* 14*s.* 11*d.* for 100*l.*, or 1½ per cent. less than last year. The average for sixty-two years from the commencement of 1836 is 97*l.* 9*s.* 11¾*d.*

HENRY ALLNUTT.

STATISTICS AFFECTING BRITISH AGRICULTURAL INTERESTS.

TABLE I.—*Average Prices of* **British Corn** *per Quarter (Imperial Measure), as received from the Inspectors and Officers of Excise conformably to the Act of* 45 & 46 *Vict. ch.* 37, *in each Week of the Year* 1897.

[*Compiled from the "London Gazette."*]

Week ending	Wheat		Barley		Oats		Week ending	Wheat		Barley		Oats	
1897	s	d	s	d	s	d	1897	s	d	s	d	s	d
January 2 .	30	6	24	8	16	2	July 3 . .	27	1	18	10	18	7
January 9 .	31	1	25	5	16	3	July 10 . .	27	4	17	4	18	8
January 16 .	31	8	24	10	16	5	July 17 . .	27	7	17	6	18	3
January 23 .	31	7	25	5	16	6	July 24 . .	28	1	18	10	18	11
January 30 .	31	3	24	7	16	8	July 31 . .	28	10	17	10	19	0
February 6 .	30	7	24	10	16	7	August 7 .	29	5	17	9	18	11
February 13 .	29	8	24	8	16	6	August 14 .	29	8	19	0	17	4
February 20 .	28	11	23	9	16	5	August 21 .	30	4	19	2	17	2
February 27 .	28	2	23	8	16	3	August 28 .	31	8	22	5	17	1
March 6 . .	28	3	23	0	16	3	September 4 .	33	7	25	11	17	0
March 13 .	27	11	22	11	16	2	September 11 .	33	1	27	4	17	3
March 20 .	27	11	22	8	16	2	September 18 .	33	10	28	11	17	0
March 27 .	27	9	22	5	16	3	September 25 .	33	11	29	7	16	8
Average of Winter Quarter	29	7	24	0	16	4	Average of Summer Quarter	30	4	21	6	17	10
April 3 . .	27	10	22	3	16	3	October 2 .	33	4	29	10	16	4
April 10 . .	27	8	22	7	16	6	October 9 .	32	1	28	9	16	0
April 17 . .	27	0	23	0	16	3	October 16 .	31	10	28	3	16	1
April 24 . .	26	6	20	7	16	7	October 23 .	32	2	27	5	16	2
May 1 . .	27	9	20	5	17	3	October 30 .	32	10	27	5	16	0
May 8 . .	28	4	21	5	16	11	November 6 .	33	5	26	10	16	5
May 15 . .	27	11	20	2	17	7	November 13 .	34	0	26	3	16	3
May 22 . .	28	1	19	10	17	9	November 20 .	33	11	26	2	16	5
May 29 . .	28	2	21	3	17	10	November 27 .	33	8	25	9	16	8
June 5 . .	27	10	20	8	17	9	December 4 .	33	9	25	10	16	9
June 12 . .	27	4	22	8	17	11	December 11 .	33	9	26	0	16	6
June 19 . .	27	0	23	9	18	0	December 18 .	34	1	26	4	17	0
June 26 . .	27	0	19	9	18	6	December 25 .	34	4	26	11	17	0
Average of Spring Quarter	27	6	21	4	17	3	Average of Autumn Quarter	33	3	27	0	16	5

TABLE II.—*Annual Average Prices, and Quantities of* **British Corn** *sold in the Towns in England and Wales from which Returns are received under the Act of* 45 *&* 46 *Vict. ch.* 37, *in each of the Years* 1888 *to* 1897.

[*From the "London Gazette."*]

Year	Wheat	Barley	Oats	Wheat	Barley	Oats
	s. d.	*s. d.*	*s. d.*	Qrs.	Qrs	Qrs
1888	31 10	27 10	16 9	2,427,861	1,911,835	255,726
1889	29 9	25 10	17 9	2,945,408	3,329,814	415,783
1890	31 11	28 8	18 7	3,439,699	3,327,991	599,033
1891	37 0	28 2	20 0	3,248,743	3,255,518	561,713
1892	30 3	26 2	19 10	3,052,879	3,493,634	492,166
1893	26 4	25 7	18 9	2,620,060	3,366,056	575,522
1894	22 10	24 6	17 1	1,956,824	2,729,348	565,747
1895	23 1	21 11	14 6	1,928,383	3,426,576	665,939
1896	26 2	22 11	14 9	2,111,021	3,391,862	655,153
1897	30 2	23 6	16 11	2,756,561	3,257,187	550,434

TABLE III.—*Returns published pursuant to the Corn Returns Act*, 1882, *and to Act of* 6 *&* 7 *Wm. IV. for "Commutation of Tithes in England and Wales," showing what has been, during the Seven Years ending Christmas Day in each Year, the Average Price of an Imperial Bushel of* **British Wheat, Barley** *and* **Oats**, *computed from the Weekly Averages of Corn Returns in each of the Years* 1891–97.

[*From the "London Gazette."*]

Year	Average (Septennial) Prices per Bushel		
	Wheat	Barley	Oats
	s. d	*s d.*	*s. d.*
1891	4 0½	3 5¼	2 3½
1892	4 0	3 4¼	2 3¾
1893	3 11	3 4	2 3¼
1894	3 9	3 4	2 3½
1895	3 7	3 2¼	2 3
1896	3 6¼	3 2	2 2¼
1897	3 5¾	3 1	2 2

TABLE IV.—*Average Prices of* **Wool** *in each of the Years* 1891 *to* 1897.

Year	English[1]				Australasian	South African
	Leicester	Half-breds	Kent	Southdown		
	Per lb. *d.* *d.*	Per lb *d.* *d.*	Per lb *d.* *d.*	Per lb. *d.* *s.* *d.*	Per lb. *d.*	Per lb. *d.*
1891	9½ to 10	10 to 10¾	9½ to 10¼	10½ to 1 1	9¾	9¾
1892	8½ ,, 9	9¾ ,, 10¼	9¼ ,, 9¾	10½ ,, 1 0½	9	9½
1893	8½ ,, 9¼	9½ ,, 10¼	9 ,, 9¾	10½ ,, 1 0	8¾	9¼
1894	9 ,, 10	9½ ,, 10¾	9¼ ,, 10¼	9¾ ,, 1 0	8½	9¼
1895	9½ ,, 10½	9½ ,, 10¾	9½ ,, 10¾	9¾ ,, 0 11¼	8	9¼
1896	9¼ ,, 11	9¼ ,, 10¾	9¼ ,, 10¾	9¼ ,, 0 11¼	8¾	7¾
1897	8¾ ,, 10	8¾ ,, 10	8½ ,, 9¾	9 ,, 0 10½	8¼	7½

[1] The prices of English wool have been calculated from the list given weekly in the *Economist* newspaper.

TABLE V.—*Number and Value of* **Live Cattle, Sheep,** *and* **Swine** *Imported into the United Kingdom in the undermentioned Years.*

[*From Trade and Navigation Returns.*]

—		Number 1895	Number 1896	Number 1897	Value 1895	Value 1896	Value 1897
					£	£	£
Cattle	From Channel Islands	1,708	1,719	1,633	28,875	32,106	31,048
	" Canada . .	95,993	101,591	126,495	1,593,304	1,607,899	2,045,209
	" United States .	276,533	393,119	416,299	4,916,880	6,735,519	7,230,854
	" Argentine Republic .	39,494	65.699	73,867	614,453	923.638	1,153,747
	" Other Countries	1.837	425	42	29,528	5,893	378
	Total . .	415,565	562,553	618,336	7,183,040	9,305,055	10,461,236
Sheep and Lambs	From Canada . .	214,310	83,767	63,761	387,181	125,956	95,602
	" United States .	453,250	266,760	186,755	769,864	405,803	272,421
	" Argentine Republic .	308,094	339,381	345,217	505,537	501,712	528,607
	" Other Countries[1]	89,816	79,684	15,771	119,962	100,163	22,466
	Total . .	1,065,470	769,592	611.504	1,782,544	1,133,634	919,096
Swine (not separately enumerated) . . .		321	4	. .	668	10	. .
TOTAL VALUE OF LIVING ANIMALS . . .		. .	. .	. .	8,966,252	10,438,699	11,380,332

[1] Imported chiefly from Iceland.

TABLE VI.—*Quantity and Value of* **Fruit** *and* **Vegetables** *Imported into the United Kingdom in the Years* 1895, 1896 *and* 1897.

[*From Trade and Navigation Returns.*]

—	Quantity 1895	Quantity 1896	Quantity 1897	Value 1895	Value 1896	Value 1897
	Bushels	Bushels	Bushels	£	£	£
Apples	3,292,262	6,176,956	4,199,971	960,273	1,582,495	1,187,303
Cherries	195,632	219,367	312,364	96,047	105,811	178,131
Plums	401,080	560,245	1,033,819	166,045	241,782	497,783
Pears	407,146	483,823	1,051,694	166,696	206,674	377,808
Grapes	865,287	883,244	995,413	486,981	442,828	495,642
Oranges and Lemons . .	8,674,209	8,890,887	10,346,121	2,476.510	2,369,645	2,677,070
Unenumerated . . .	1,249,563	1,427,105	1,725,526	513,261	590,766	695,404
Onions	5,734,768	6,086,905	6.108,928	696,428	681,949	760,630
	Cwt.	Cwt.	Cwt			
Potatoes	3,758,156	2,244,627	3,922.319	1,169,922	907,975	1,200,390
Vegetables, Raw, unenum d .	. .	. .	. .	1,277,266	1,284,753	1,454,720
Hops	217,161	207,041	164,154	644,505	591,582	524,297
TOTAL VALUE OF FRUITS, &C.	. .	. .	. .	8,653,934	9,006,260	10,049,178

TABLE VII.—*Quantities and Values of* **Animals for Food, Corn, Meat, Dairy Produce, Poultry,** *and* **Eggs,** *Imported into the United Kingdom in the Years* 1895, 1896, *and* 1897.

[*From Trade and Navigation Returns.*]

—	Quantities			Values		
	1895	1896	1897	1895	1896	1897
ANIMALS, LIVING (for food) :—	No.	No.	No.	£	£	£
Cattle	415,565	562,553	618,336	7,183,040	9,305,055	10,461,236
Sheep and Lambs	1,065,470	769,592	611,504	1,782,544	1,133,634	919,036
Swine	321	4	..	668	10	..
TOTAL VALUE	...	...	..	8,966,252	10,438,699	11,380,332
CORN :—	Cwt.	Cwt.	Cwt.	£	£	£
Wheat	81,749,955	70,025,980	62,743,280	22,531,176	21,678,989	23,363,505
Wheat Meal and Flour	18,368,410	21,320,200	18,680,669	7,679,013	9,227,873	9,599,656
Barley	28,618,867	22,477,322	18,958,720	5,538,405	5,709,531	4,681,074
Oats	15,528,310	17,586,730	16,116,810	3,723,465	4,226,317	4,038,813
Peas	2,422,851	3,018,657	2,820,135	693,828	852,634	771,054
Beans	4,130,538	3,102,990	2,840,050	1,079,780	837,417	762,275
Maize	33,944,350	51,772,100	53,785,380	7,808,860	9,422,539	9,188,978
Oatmeal	468,941	554,750	732,495	277,736	330,966	434,672
Maize Meal	164,179	368,100	1,029,301	75.523	123,313	261,120
Other kinds of Corn and Meal	...	..	..	315,507	390,504	478,598
TOTAL VALUE	..	...		49,723,293	52,800,083	53,579,745
MEAT :—	Cwt.	Cwt.	Cwt.	£	£	£
Beef, Salted	219,956	247,536	175,236	286,511	303,700	216,241
„ Fresh	2,191,037	2,659,700	3,010,387	4,275,548	5,028,828	5,783,667
Mutton, Fresh	2,611,435	2,895,158	3,193,276	4,595,678	4,718,546	4,827,868
Bacon	4,063,418	4,549,526	5,004,915	7,925,979	7,854,515	8,867,846
Hams	1,289,518	1,459,412	1,725,875	2,898,018	3,136,089	3,681,958
Pork, Salted (not Hams)	220,168	255,339	237,206	269,829	291,966	253,693
„ Fresh	288,284	299,411	347,617	664,946	687,241	765,128
Meat, unenumerated—Salted or Fresh	237,468	279,390	364,822	490,650	554,064	727,283
Meat preserved otherwise than by Salting	856,153	701,750	669,785	2,040,006	1,775,507	1,701,306
Rabbits	120,279	170,873	276,458	315,594	401,614	543,494
TOTAL OF DEAD MEAT	12,097,716	13,518,095	15,005,577	23,762,759	24,752,070	27,368,484
DAIRY PRODUCE :—	Cwt.	Cwt.	Cwt.	£	£	£
Butter	2,825,662	3,037,718	3,217,801	14,245,280	15,344,364	15,916,911
Margarine	940,168	925,934	936,543	2,557,170	2,498,425	2,485,370
Cheese	2,133,819	2,244,525	2,603,608	4,675,130	4,900,342	5,886,546
Milk, Condensed	545,394	611,335	751,743	1,083,559	1,170,352	1,398,363
TOTAL OF DAIRY PRODUCE	6,445,043	6,819,512	7,509,695	22,561,089	23,913,483	25,687,130
POULTRY, &c. :—				£	£	£
Poultry and Game, alive or dead	...	...	...	605,160	705,478	730,725
	Gt. Hunds.	Gt. Hunds.	Gt. Hunds.			
Eggs	12,722,586	13,245,011	14,031,752	4,003,446	4,184,656	4,356,799
TOTAL VALUE	...	...	...	4,608,606	4,890,134	5,087,524

TABLE VIII.—*Quantities and Values of* **Dead Meat** *Imported into the United Kingdom in the Four Years* 1894 *to* 1897.

[*From Trade and Navigation Returns.*]

Thousands ("000") omitted.

DEAD MEAT		1894		1895		1896		1897	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
BACON.—		Cwt	£	Cwt	£	Cwt.	£	Cwt	£
	From United States	2,561	5,083	2,649	4,586	2,752	4,067	3,593	5,354
	" Denmark	767	2,130	1,014	2,505	1,222	2,792	1,027	2,744
	" Canada	254	525	269	501	457	696	290	523
	" Other Countries	107	286	1[illegible]1	334	119	299	95	247
	Total	3,690	8,084	4,063	7,926	4,550	7,855	5,005	8,868
BEEF:—									
Salted	From United States	235	333	212	275	241	295	172	212
	" Other Countries	7	10	8	12	7	9	3	4
	Total	242	343	220	287	248	304	175	216
Fresh	From United States	1,776	3,726	1,649	3,450	2,075	4,216	2,242	4,609
	" Other Countries	329	487	542	825	585	813	768	1,175
	Total	2,104	4,214	2,191	4,276	2,660	5,029	3,010	5,784
HAMS:—									
	From United States	1,075	2,631	1,203	2,697	1,286	2,758	1,604	3,412
	" Canada	51	127	82	186	169	365	119	260
	" Other Countries	4	13	5	14	4	12	3	10
	Total	1,130	2,772	1,290	2,898	1,459	3,136	1,726	3,682
MEAT, Unenumerated:—									
Salted or Fresh	From Holland	103	237	151	321	163	345	225	472
	" United States	34	62	37	66	61	99	76	127
	" Other Countries	46	112	49	104	56	110	64	129
	Total	190	411	237	491	279	554	365	727
Preserved, otherwise than by Salting	Beef	291	814	471	1,164	402	1,054	373	999
	Mutton	113	195	200	335	123	202	99	162
	Other Sorts	150	482	185	541	177	520	198	540
	Total	554	1,491	856	2,040	702	1,776	670	1,701
MUTTON, Fresh:—									
	From Holland	200	453	167	371	229	516	267	592
	" Australasia	1,440	2,773	1,671	3,107	1,853	3,105	2,009	3,040
	" Argentine Republic	586	959	715	1,000	802	1,072	909	1,175
	" Other Countries	70	157	58	118	11	25	9	20
	Total	2,295	4,341	2,611	4,596	2,895	4,718	3,193	4,828
PORK:—									
Salted (not Hams)	From United States	150	237	123	170	138	176	141	168
	" Other Countries	75	99	97	100	118	116	96	86
	Total	225	336	220	270	255	292	237	254
Fresh	From Holland	134	316	246	569	244	557	226	489
	" Belgium	31	77	27	67	39	98	37	93
	" Other Countries	16	43	15	29	16	32	85	184
	Total	180	437	288	665	299	687	348	765
RABBITS:—									
	From Belgium	86	234	86	234	92	251	84	227
	" Other Countries	22	64	34	81	79	151	192	316
	Total	108	298	120	316	171	402	276	543
TOTAL OF DEAD MEAT		10,719	22,725	12,098	23,763	13,518	24,752	15,006	27,368

TABLE IX.—*Quantities and Values of* **Butter, Margarine, Cheese, Milk, Poultry,** *and* **Eggs** *Imported into the United Kingdom in each Year from* 1895 *to* 1897 *inclusive; also Countries from which they were obtained.*

[*From Trade and Navigation Returns.*]

—	QUANTITIES			VALUES		
	1895	1896	1897	1895	1896	1897
BUTTER	Cwt.	Cwt	Cwt.	£	£	£
From Sweden	310,809	323,829	299,214	1,644,111	1,664,685	1,515,705
„ Denmark	1,162,770	1,228,784	1,334,726	5,948,463	6,288,413	6,748,163
„ Germany	112,338	107,825	51,761	565,093	536,246	263,097
„ Holland	191,201	234,469	278,631	939,326	1,156,726	1,353,343
„ France	454,843	467,602	448,128	2,443,734	2,537,695	2,330,576
„ New South Wales	45,837	7,777	23,835	203,938	37,691	112,218
„ Victoria	212,797	154,865	169,075	982,682	769,695	816,399
„ New Zealand	53,262	56,370	76,522	232,009	277,898	366,956
„ Canada	38,949	88,357	109,402	153,401	339,744	444,862
„ United States	66,932	141,553	154,196	271,776	617,525	633,549
„ Other Countries	175,924	226,287	272,311	860,697	1,118,046	1,332,043
Total	2,825,662	3,037,718	3,217,801	14,245,230	15,344,364	15,916,911
MARGARINE						
From Norway	9,377	10,158	10,827	25,259	28,102	29,785
„ Holland	878,827	861,887	872,595	2,371,711	2,304,335	2,292,162
„ France	28,132	30,523	30,563	99,733	104,556	106,105
„ Other Countries	23,832	23,366	22,558	60,467	61,432	57,318
Total	940,168	925,934	936,543	2,557,170	2,498,425	2,485,370
CHEESE						
From Holland	305,920	292,988	297,559	774,790	734,611	748,136
„ France	56,393	45,676	36,358	175,541	139,532	110,087
„ Australasia	92,759	55,149	69,090	219,615	115,479	162,915
„ Canada	1,150,018	1,234,297	1,526,664	2,335,548	2,589,301	3,349,501
„ United States	500,419	581,187	631,616	1,099,283	1,234,037	1,413,079
„ Other Countries	28,310	35,228	42,321	70,323	87,382	102,828
Total	2,133,819	2,244,525	2,603,608	4,675,130	4,900,342	5.886,546
MILK (condensed)	545,394	611,335	751,743	1,083,559	1,170,352	1,398,363
POULTRY (and Game)						
From Russia	...	...	...	85,697	143,584	186,825
„ Belgium	...	..	...	126,440	143,388	164,179
„ France	...	...	...	261,503	302,902	256,113
„ Other Countries	...	...	...	131,520	115,604	123,608
Total	...	...	...	605,160	705,478	730,725
EGGS	Great Hundreds	Great Hundreds	Great Hundreds	£	£	£
From Russia	2,229,930	2,406,168	3,132,333	601,460	630,052	812,297
„ Denmark	1,279,013	1,566,623	1,748,800	447,709	522,985	596,282
„ Germany	3,406,578	2,930,486	2,971,846	916,821	782,121	813,022
„ Belgium	2,361,680	2,243,909	2,464,180	713,464	694,322	768,077
„ France	2,730,332	3,275,776	2,675,667	1,069,580	1,273,200	1,022,869
„ Canada	436,903	500,317	568,769	156,653	178,931	193,998
„ Other Countries	278,150	321,732	470,157	97,759	103,045	150.254
Total	12,722,586	13,245,011	14,031,752	4,003,446	4,184,656	4,356,799

TABLE X.—*Value of* Corn, *&c., Imported into the United Kingdom, in each of the Five Years,* 1893–97.

[*From Trade and Navigation Returns*]

	1893	1894	1895	1896	1897
	£	£	£	£	£
Wheat . . .	21,070,028	18,760,505	22,531,176	21,678,989	23,363,505
Wheat Flour . .	9,761,510	7,994,673	7,679,013	9,227,873	9,599,656
	30,831,538	26,755,178	30,210,189	30,906,862	32,963,161
Barley . . .	5,776,033	7,090,579	5,538,405	5,709,531	4,681,074
Oats . . .	4,297,986	3,900,096	3,723,465	4,226,317	4,038,813
Maize . . .	7,892,629	7,952,238	7,808,860	9,422,539	9,188,978
Maize Meal . .	37,330	40,968	75,523	123,313	261,120
Peas . . .	729,294	647,194	1,079,780	837,417	762,275
Beans . . .	1 127,559	1,346,096	693,828	852,634	771,054
Oatmeal .	488,002	487,876	277,736	330,966	434,672
Other kinds of Corn and Meal			315,507	390,504	478,598
Total of Corn, &c.	51,180,371	48,220,225	49,723,293	52,800,083	53,579,745

TABLE XI.—*Quantities of* Wheat, *and of* Wheat Meal *and* Flour, *Imported into the United Kingdom in each of the Five Years,* 1893–97; *also the Countries from which they were obtained.*

[*From Trade and Navigation Returns.*]

Thousands ("000") omitted.

	1893	1894	1895	1896	1897
WHEAT *from*—	Cwt.	Cwt	Cwt	Cwt.	Cwt.
Russia	10,062	16,776	23,017	17,242	15,050
Germany	362	715	753	1,033	1,333
Turkey	104	340	1,300	1,930	1,863
Roumania	89	108	2,022	5,401	1,224
United States.	32,263	24,658	27,084	30,695	34,603
Chile	2,580	1,764	1,039	1,936	1,019
Argentine Republic . .	7,846	13,272	11,400	4,928	933
British East Indies . . .	6,196	5,349	8,803	2,113	573
Australasia	2,590	3,877	3,487	7	—
British North America .	3,157	2,829	1,845	3,618	4,821
Other Countries	214	435	1,000	1,124	1,324
TOTAL WHEAT . . .	65,462	70,126	81,750	70,026	62,743
WHEAT MEAL AND FLOUR *from*—	Cwt.	Cwt.	Cwt	Cwt	Cwt.
Germany	116	199	244	205	74
France	52	481	1,126	1,719	1,682
Austrian Territories . .	1,100	1,107	1,306	1,388	1,144
United States.	17,996	15,925	13,132	15,905	14,063
British North America .	1,081	1,195	2,343	1,933	1,531
Other Countries	63	227	218	170	187
TOTAL WHEAT MEAL AND FLOUR . . .	20,408	19,135	18,368	21,320	18,681

TABLE XII.—*Number of* Horses, Cattle, Sheep, *and* Pigs *Imported into Great Britain from Ireland in each of the Years* 1891–97.

—	1891	1892	1893	1894	1895	1896	1897
HORSES:							
Stallions . . .	125	113	151	163	158	191	153
Mares	14,055	14,273	13,356	14,484	15,370	18,046	17,590
Geldings . . .	19,216	18,095	16,883	18,912	19,002	21,619	20,679
Total . .	33,396	32,481	30,390	33,589	34,560	39,556	38,422
CATTLE:							
Oxen, Bulls, and Cows: Fat . .	240,183	256,538	316,344	330,748	302,555	274,472	259,173
Oxen, Bulls, and Cows: Store. .	323,075	305,373	318,545	422,534	414,859	349,800	419,302
Oxen, Bulls, and Cows: Other Cattle .	3,985	6,278	8,473	7,805	5,622	3,837	5,043
Calves	63,559	56,268	45,307	65,867	68,571	53,451	62,494
Total. . .	630,802	624,457	688,669	826,954	791,607	681,560	746,012
SHEEP:							
Sheep	569,698	713,528	705,299	574,471	351,975	397,164	435,709
Lambs	323,477	366,674	402,661	382,630	300,603	340,142	368,806
Total. . .	893,175	1,080,202	1,107,960	957,101	652,578	737,306	804,515
PIGS:							
Fat	459,596	457,977	405,242	515,647	500,700	574,677	653,459
Store.	43,988	42,974	51,329	69,320	46,520	35,912	41,848
Total . .	503,584	500,951	456,571	584,967	547,220	610,589	695,307

TABLE XIII.—*Number of* Horses, *and their Declared Value, Imported into, and Exported from, the United Kingdom in each of the Years* 1892–97.

[*From Trade and Navigation Returns.*]

Year	Imported		Year	Exported	
	Number	Value		Number	Value
		£			£
1892	20,994	425,401	1892	11,233	563,364
1893	13,707	376,819	1893	11,361	472,762
1894	22,866	548,058	1894	16,457	449,804
1895	34,092	921,490	1895	21,564	549,882
1896	40,677	1,027,736	1896	29,414	671,332
1897	49,519 [1]	1,254,342	1897	34,506	825,926

[1] NOTE.—The countries from which horses were *imported* in 1897 were as follow: United States, 26,520; Canada, 11,247; other countries, 11,752.

TABLE XIV.—*Numbers and Prices of* **Live-stock** *in* 1895, 1896, *and* 1897, *as returned under the Markets and Fairs (Weighing of Cattle) Act* 1891.

[*From Journal of the Board of Agriculture.*]

NUMBER OF ANIMALS reported as ENTERING THE 19 SCHEDULED PLACES in Great Britain, together with the Numbers WEIGHED and the Numbers PRICED.

Animals	1897	1896	1895
	No.	No.	No.
CATTLE:			
Entering markets	1,115,183	1,100,014	1,186,149
Weighed	111,767	109,184	100,033
Prices returned	100,371	99,537	88,403
Prices returned with quality distinguished	78,329	75,014	64,072
SHEEP:			
Entering markets	4,194,310	4,309,943	4,330,256
Weighed	41,969	41,685	34,886
Prices returned with quality distinguished	36,692	35,048	23,577
SWINE:			
Entering markets	211,613	232,344	233,189
Weighed	2,333	4,585	2,803
Prices returned	1,368	1,686	1,226
Prices returned with quality distinguished	1,368	1,686	17

CALCULATED AVERAGE PRICE PER LIVE CWT. IN TEN SELECTED PLACES

(Obtained by dividing the total price by the total weight of the weighed fat cattle, of all descriptions, in each of the three qualities or grades).

Places	Inferior or third quality		Good or second quality		Prime or first quality	
	1897	1896	1897	1896	1897	1896
	Per cwt. s. d.	Per cwt. s. d.	Per cwt. s. d.	Per cwt. s. d.	Per cwt. s. d.	Per cwt. s. d.
ENGLAND:						
Leeds	27 8	26 10	30 4	29 2	32 4	32 2
Liverpool	25 10	—	30 0	28 4	32 8	32 4
London	28 4	27 8	33 8	32 8	38 10	37 0
Newcastle	27 2	26 0	30 8	30 4	36 2	33 10
Shrewsbury	25 4	25 0	30 6	30 0	34 6	34 4
SCOTLAND:						
Aberdeen	24 8	23 8	33 0	31 6	36 0	34 10
Dundee	27 6	25 2	32 6	31 4	35 2	33 6
Edinburgh	—	27 2	33 10	32 6	35 8	33 4
Glasgow	30 8	31 6	32 10	31 4	35 10	35 0
Perth	31 4	29 10	33 10	31 10	35 10	33 10

TABLE XV.—*Number of Tons of* **Frozen Mutton** *and* **Lamb** *Imported into the United Kingdom from the Countries named in each Year from* 1884 *to* 1897.

[*From Messrs. W. Weddel & Co.'s "Review of the Frozen Meat Trade*, 1897," *corrected to date*.]

Year	From New Zealand	From River Plate	From Australia	Totals
	Tons	Tons	Tons	Tons
1884	13,000	2,011	2,206	17,217
1885	14,200	5,611	2,678	22,489
1886	17,328	9,520	1,885	28,733
1887	19,782	12,563	2,122	34,467
1888	24,931	17,269	2,224	44,424
1889	28,425	19,765	2,105	50,295
1890	39,366	21,754	5,491	66,611
1891	44,806	21,818	8,366	74,990
1892	38,283	23,556	10,586	72,4[illegible]5
1893	45,015	25,780	14,[illegible]57	[illegible]3,152
1894	48,553	29,286	23,4[illegible]1	[illegible]
1895	56,5[illegible]2	36,406	25,2[illegible]6	12[illegible],22[illegible]
1896	53,955	40,136	38,823	1[illegible]2,914
1897	65,116	15,431	35,3[illegible]8 [1]	115,885

[1] Decrease owing chiefly to drought in New South Wales and Queensland.

TABLE XVI.—*Home Product and Importations of* **Sheep** *and* **Mutton** (*United Kingdom*) *in each Year from* 1884 *to* 1897.

Year	Population at the middle of each year	Number of Sheep and Lambs enumerated annually in June (from *Agricultural Returns*)	Estimated Dead Weight of Sheep and Lambs slaughtered, say 40 per cent. of Total Number	Weight of Fresh Mutton and Lamb, and estimated Dead Weight of Sheep Imported
			Tons	Tons
1884	(estimated) *35,724,231*	29,376,787	315,000	48,745
1885	„ *36,015,601*	30,086,200	322,000	47,355
1886	„ *36,313,582*	28,955,240	310,000	58,588
1887	„ *36,599,143*	29,401,750	315,000	63,527
1888	„ *36,881,271*	28,938,716	310,000	73,360
1889	„ *37,178,929*	29,484,774	316,000	78,285
1890	„ *37,484,764*	31,667,195	339,000	91,782
1891	(census) 37,704,283	33,533,988	359,000	91,762
1892	(estimated) *38,106,675*	33,642,808	360,000	86,974
1893	„ *38,440,249*	31,774,824	340,000	100,142
1894	„ *38,779,031*	30,037,818	322,000	127,917
1895	„ *39,166,821*	29,774,853	318,500	137,155
1896	„ *39,558,489*	30,853,809	329,000	164,000
1897	„ *39,954,073*	30,567,113	327,000	175,400

Table XVII.—*Quantity and Value of* **Wool, Wood, Seeds, Manures,** *&c., Imported into the United Kingdom in the Years* 1895 *to* 1897.
[*Compiled from Trade and Navigation Returns.*]

—	Quantity 1895	Quantity 1896	Quantity 1897	Value 1895	Value 1896	Value 1897
				£	£	£
Wool, Sheep and Lambs' . . lb.	770,955,203	713,575,173	735,632,516	26,025,960	24,958,346	24,436,872
Wood and Timber:						
Hewn . . . . loads	2,260,761	2,432,790	2,827,746	4,181,436	4,889,374	5,781,070
Sawn or Split, Planed or Dressed . . ,,	5,061,986	6,031,492	7,018,242	10,695,916	13,380,580	16,628,200
Staves . . . . ,,	144,751	138,393	126,745	594,615	656,246	569,572
Seeds:						
Clover and Grass . cwt.	396,280	405,617	299,946	855,524	788,538	578,958
Cotton . . . tons	374,111	368,419	412,879	1,750,437	1,729,509	1,925,351
Flax or Linseed . . qrs.	1,969,987	2,578,864	1,908,628	3,366,113	4,022,676	2,988,503
Rape . . . . ,,	325,393	179,730	185,332	307,348	195,527	258,233
Manures:						
Bones (burnt or not) tons	74,056	66,681	58,208	320,051	251,866	213,512
Guano . . . ,,	49,812	20,214	16,164	392,309	104,354	85,537
Nitrate of Soda . . ,,	122,687	106,445	10[illegible],832	998,897	836,552	811,865
Phos. of Lime & Rock ,,	359,659	291,314	325,133	633,314	465,931	493,212
Cotton, Raw . . . cwt.	15,687,881	15,668,663	15,394,234	30,429,428	36,272,039	32,194,732
Hemp . . . . ,,	1,959,020	1,834,360	1,798,120	2,087,667	1,951,506	1,763,459
Flax . . . . ,,	2,052,410	1,903,980	1,976,040	3,270,840	3,117,316	3,203,184
Linen Yarn . . . lb.	25,658,917	20,069,122	15,907,161	998,416	779,641	618,375
Hides, Raw: Dry . . cwt.	491,547	369,063	556,587	1,153,757	905,425	1,413,166
,, ,, Wet . . ,,	771,133	604,734	638,658	1,650,369	1,319,516	1,336,988
Leather . . . . ,,	1,267,441	1,246,252	1,278,683	8,050,471	7,594,592	7,648,147
Petroleum . . gallons	177,146,628	189,953,945	186,706,469	3,368,904	3,732,056	3,351,539
Lard . . . . cwt.	1,742,688	1,739,463	1,740,468	2,941,941	2,268,693	1,993,143
Oil-Seed Cake . . tons	313,618	316,073	336,958	1,603,650	1,589,214	1,834,731

Table XVIII.—*Summary of Agricultural Produce Statistics* (**Hay and Potatoes**) *for England, Wales, Scotland, and Great Britain in* 1897 *and* 1896.[1]

—	Estimated Total Produce 1897	Estimated Total Produce 1896	Area 1897	Area 1896	Estimated Yield per Acre 1897	Estimated Yield per Acre 1896	Average Yield per Acre 1887–96
HAY FROM PERMANENT GRASS.							
	Tons	Tons	Acres	Acres	Cwt.	Cwt.	Cwt.
England .	4,965,000	3,487,000	3,901,563	3,967,426	25·44	17·58	22·90
Wales . .	479,000	325,000	473,725	500,565	20·20	12·99	17·48
Scotland .	194,000	248,000	134,497	169,932	28·84	29·23	28·31
Great Britain	5,636,000	4,060,000	4,509,785	4,637,923	24·99	17·51	22·53
HAY FROM CLOVER, SAINFOIN, AND ROTATION GRASSES.							
	Tons	Tons	Acres	Acres	Cwt.	Cwt.	Cwt.
England .	2,434,000	1,806,000	1,692,612	1,601,537	28·75	22·55	27·37
Wales . .	248,000	161,000	196,251	177,455	25·26	18·17	22·21
Scotland .	638,000	657,000	397,102	392,974	32·13	33·44	30·64
Great Britain	3,320,000	2,624,000	2,285,965	2,171,966	29·04	24·16	27·58
POTATOES.							
	Tons	Tons	Acres	Acres	Tons	Tons	Tons
England .	1,896,000	2,539,000	362,365	400,104	5·38	6·35	6·06
Wales . .	166,000	218,000	32,609	33,848	5·10	6·45	5·82
Scotland .	546,000	805,000	119,940	129,789	4·55	6·20	5·76
Great Britain	2,608,000	3,562,000	504,914	563,741	5·17	6·32	5·97

[1] A similar summary for Wheat, Barley and Oats in 1897 and in 1896 is given in the preceding number of the Journal, vol. viii. (part iv.) 1897 p. 788.

Rainfall, Temperature *and* **Bright Sunshine** *experienced over* **England** *and* **Wales** *during the whole of* **1897,** *with Average and Extreme Values for Previous Years.*

Districts	Rainfall: Total Fall: In 1897	Total Fall: For previous 31 years: Average	Total Fall: Extremes: Driest	Total Fall: Extremes: Wettest	No. of Days with Rain: In 1897	No. of Days: For previous 16 years: Average	No. of Days: Extremes: Driest	No. of Days: Extremes: Wettest
	ins.	ins.	ins.	ins.				
North-eastern counties .	24·4	26·1	19·9 (1884)	37·2 (1872)	183	189	162 (1884)	208 (1894)
Eastern counties . .	23·0	25·6	19·1 (1874 and 1887)	33·1 (1872)	174	185	163 (1884)	205 (1894)
Midland " . .	28·0	28·1	19·2 (1887)	39·8 (1872)	178	180	148 (1887)	210 (1882)
Southern " . .	26·7	29·0	21·5 (1887)	41·7 (1872)	168	176	150 (1887)	197 (1882)
North-western counties, including North Wales	37·1	38·8	24·9 (1887)	59·2 (1872)	199	197	163 (1887)	222 (1882)
South-western counties, including South Wales	43·7	42·8	28·3 (1887)	63·6 (1872)	206	200	159 (1887)	235 (1882)
Channel Islands[1] . .	35·9	32·8	26·2 (1887)	39·5 (1882)	218	213	181 (1887)	251 (1886)

Districts	Mean Temperature: In 1897	Mean Temperature: For previous 31 years: Average	Extremes: Coldest	Extremes: Warmest	Hours of Bright Sunshine: In 1897	For previous 16 years: Average	Extremes: Cloudiest	Extremes: Sunniest
	°	°	°	°				
North-eastern counties .	47·9	47·2	45·0 (1879)	48·8 (1868)	1432	1282	1006 (1885)	1558 (1893)
Eastern counties . .	48·9	48·3	45·8 (1879)	51·0 (1868)	1607	1536	1267 (1888)	1831 (1893)
Midland " . .	48·7	48·3	45·8 (1879)	51·1 (1868)	1515	1392	1173 (1888)	1715 (1893)
Southern " . .	50·9	49·4	46·9 (1879)	51·2 (1868 and 1893)	1696	1545	1245 (1888)	1875 (1893)
North-western counties, including North Wales	49·1	48·4	45·9 (1879)	50·3 (1868 and 1893)	1519	1318	1198 (1888)	1519 (1887)
South-western counties, including South Wales	50·7	50·1	48·3 (1888)	52·8 (1868)	1647	1647	1459 (1888)	1964 (1893)
Channel Islands[1] . .	53·2	51·7	50·7 (1885)	53·9 (1893)	1750	1919	1710 (1888)	2300 (1893)

NOTE.—The above Table is compiled from information given in the Weekly Weather Report of the Meteorological Office.

[1] For the Channel Islands the "Averages" and "Extremes" of Rainfall and Mean Temperature are for the previous sixteen years only.

The Rainfall of 1897 *and of the previous Ten Years, with the Average Annual Fall for a long period, as observed at thirty-eight stations situated in various parts of the United Kingdom.*

Stations	1897 Total Rain-fall	1897 Difference from Average	Rainfall of Previous Years 1896	1895	1894	1893	1892	1891	1890	1889	1888	1887	Average[1] Rain-fall
	Ins.	Per cent.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
ENGLAND AND WALES:													
Durham	21·8	−23	24·5	27·6	23·7	20·1	28·1	24·6	26·0	20·7	27·3	21·5	28·2
York	24·4	− 6	22·2	25·8	25·0	22·3	24·7	23·8	22·7	23·0	25·0	17·1	26·0
Stamford	23·1	−12	22·4	20·4	22·5	17·0	21·9	27·1	21·3	28·1	21·3	17·2	26·4
Yarmouth	20·8	−23	21·3	23·3	26·8	19·5	30·5	24·2	24·1	26·9	22·1	20·1	27·1
Cambridge	20·4	−12	20·7	22·8	23·0	21·4	25·7	26·0	17·9	26·4	20·0	15·7	23·3
Rothamsted . . .	25·0	−13	29·0	25·4	29·6	23·8	23·8	30·5	23·5	29·1	27·2	19·8	28·6
Loughborough . . .	23·9	− 8	23·5	23·0	21·0	19·1	21·0	30·0	19·0	27·1	22·6	16·9	25·9
Cheadle	32·8	− 3	29·3	29·5	27·2	27·4	31·3	35·7	28·5	30·8	28·7	22·2	34·0
Hereford	26·8	− 1	18·2	24·1	29·2	18·9	21·3	27·5	18·2	25·2	28·5	17·7	27·1
Cirencester	32·7	+ 3	23·6	25·8	35·2	20·7	23·8	36·5	22·2	26·5	30·1	20·7	31·9
Oxford	26·3	+ 2	23·5	22·5	29·7	17·6	20·5	27·5	17·8	23·5	27·2	19·4	25·7
London	23·3	− 6	22·7	21·4	28·7	19·2	23·0	28·1	22·8	24·7	26·7	20·2	24·8
Hastings	26·1	− 5	29·9	28·6	35·8	27·2	26·9	30·6	29·1	26·9	31·7	23·9	29·5
Southampton . . .	32·5	+ 4	26·3	28·3	34·9	23·5	23·9	38·8	26·4	25·4	31·8	23·3	31·3
Stonyhurst	51·3	+ 7	44·2	42·4	50·5	50·7	48·3	46·9	50·2	42·6	41·0	30·6	47·9
Manchester	30·1	+ 3	38·4	34·2	39·2	31·9	42·4	39·9	33·9	34·7	34·0	23·9	37·8
Liverpool	28·4	− 2	26·6	26·2	28·1	24·4	33·0	31·6	27·1	27·4	24·1	20·9	28·9
Llandudno	30·7	− 1	30·4	30·1	29·1	26·6	33·5	32·8	28·2	28·5	25·9	21·6	31·1
Llandovery	50·1	0	41·8	41·4	55·3	40·0	36·7	38·6	46·0	41·0	49·9	36·0	50·2
Clifton	38·9	+11	27·6	32·0	40·6	28·9	26·4	42·5	24·9	30·5	34·5	25·8	35·2
Cullompton	38·9	+ 9	27·6	34·8	40·4	29·9	28·2	39·2	31·4	30·3	36·6	24·4	35·8
Plymouth	40·4	+10	29·1	37·7	42·5	31·0	28·9	39·8	36·6	33·8	37·0	28·9	36·6
Scilly (St. Mary's) .	35·7	+ 5	25·8	29·9	38·0	26·5	28·1	36·9	32·4	27·8	29·3	25·3	34·0
Jersey (St. Aubin's) .	36·2	+ 6	33·2	34·7	39·1	29·7	31·2	35·6	33·8	32·2	34·9	26·5	34·2
[2] Mean for the whole of England and Wales	31·3	− 2	28·5	29·0	33·1	25·6	28·3	33·5	28·8	28·8	29·5	22·8	32·0
SCOTLAND:													
Wick	21·9	−23	34·7	32·9	29·5	34·9	33·6	31·2	33·4	31·7	30·0	24·1	28·5
Aberdeen	28·7	− 7	31·2	35·8	28·6	29·5	29·8	28·5	32·4	28·1	28·2	26·0	30·8
Braemar	36·5	+ 1	30·2	32·7	41·9	30·8	28·1	34·4	39·2	29·7	35·0	25·0	36·0
Leith	20·5	−11	21·7	21·9	26·1	19·2	20·6	22·6	26·0	20·0	21·3	17·4	23·4
Fort Augustus . . .	41·7	0	42·6	43·4	54·7	47·3	41·5	48·2	49·3	39·8	39·9	37·6	41·9
Fort William . . .	74·7	− 3	71·1	58·1	75·8	83·7	72·7	78·7	89·2	65·4	70·3	71·2	77·2
Glasgow	39·7	0	35·9	32·9	42·8	33·9	37·1	36·5	38·9	30·6	32·8	30·8	39·6
Glenlee	62·0	+ 9	50·7	47·8	62·1	47·5	53·5	60·9	54·6	49·6	56·7	47·7	57·0
[2] Mean for the whole of Scotland . .	41·5	+ 3	43·7	39·7	45·6	42·8	41·5	44·5	46·9	36·8	40·3	34·9	40·4
IRELAND:													
Londonderry . . .	41·6	+ 4	41·9	39·3	40·4	38·9	39·0	36·4	42·5	39·8	37·4	35·4	40·1
Markree Castle . .	45·9	+11	42·3	38·4	44·3	36·2	41·8	38·6	40·8	43·5	41·1	37·0	41·3
Armagh	35·1	+12	31·2	30·5	33·1	24·3	32·5	28·8	30·1	30·7	29·6	23·6	31·2
Dublin	29·4	+ 7	26·9	31·2	29·3	20·5	25·7	27·8	27·6	27·3	28·7	16·6	27·6
Parsonstown . . .	37·8	+16	32·4	29·0	35·9	28·3	33·9	31·8	30·7	27·0	28·5	23·0	32·7
Kilkenny	41·4	+27	29·2	33·7	38·2	26·5	32·1	34·6	31·2	30·3	34·4	19·7	32·7
[2] Mean for the whole of Ireland . .	44·5	+13	35·0	36·8	40·8	33·3	39·1	38·4	40·1	38·1	38·4	30·4	39·4

[1] The Average Fall is in nearly all cases deduced from observations extending over the thirty years 1866–95.

[2] The Mean Rainfall for each country is based upon observations made at a large number of stations in addition to those given above.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

THE MARE AND FOAL.

THE BREEDING-STUD.

THE breeding of horses, whether as a branch of agriculture or as a separate and distinct enterprise, has always been looked upon as more or less a lottery, not only as regards the type of the animals produced, but also in respect to the financial success of the undertaking. The frequent contradiction of the old maxim that like begets like—that, as the parents, so the offspring—has upset the calculations and destroyed the confidence of many an enthusiastic devotee in the service of horseflesh. If, however, the practice of breeding has not been removed altogether from the sphere of speculation, the fact has become more and more appreciated and accepted that the foundation of success must be laid in the judicious selection and mating of parent stock, not only in regard to conformation and physical capabilities, but also, and in the highest degree, to constitutional soundness. Important as this initial step may be to the production of a sound and useful race of horses, it is but the beginning of a difficult and delicate enterprise—difficult, because of the scope and variety of knowledge and experience necessary to successful breeding and stud management; delicate, because it contemplates the perpetuation of animal life and the evolution of man's ideal of equine beauty and power.

Breeding, employing the term in a physiological sense, is not too much in evidence in papers of this kind. It may not be without interest, therefore, to those who would take a wider view of the subject, to consider briefly the functions of gestation and parturition; in other words, the embryo and its life-relations with the parent.

Female Organs of Generation.

In order to render this branch of the subject intelligible to the general reader it will be necessary to briefly consider the female organs of generation. These comprise: 1. The ovaries. 2. The Fallopian tubes. 3. The uterus or womb. 4. The vagina or genital passage. 5. The vulva and clitoris.

The *Ovaries* (figs. 1 and 4) are the essential organs of generation, in form and character resembling the testicles of the male. They are two ovoid bodies suspended from the spine immediately behind the kidneys. In structure they consist of interlacing bundles of connective tissue, branching blood-vessels, and nerves, in the midst of which are embedded a number of small bladder-like bodies, termed Graafian vesicles or ovisacs (fig. 1). These are chiefly located near to the circumference of the organ, and vary in size with their age and progress towards maturity. The younger and smaller ones are placed near the surface, while those further advanced in development are more deeply situated. When fully matured they are filled with a transparent yellowish fluid of the consistence of water, and contain also the ovum or egg, out of which is developed the future horse.

The *Ovum* (figs. 2 and 3) is a small cell or sac about $\frac{1}{100}$ of an inch in diameter. When ripe it escapes from the ovary by the bursting of the Graafian vesicle, an act always associated with the condition termed œstrum, or horsing. On leaving the ovary the extruded egg enters the Fallopian tube, and by it is conducted into the uterus.

The *Fallopian Tube* (fig. 4) is a narrow duct extending in a wavy course from the extremity of the horn of the uterus, where it is small, to the ovary, where it spreads out like the wide end of a trumpet. The purpose of this duct is, as just stated, to convey the discharged egg from the ovary into the uterus; but before this can be done the ovum must first be secured, or it will fall into the cavity of the belly. To guard against this the free, broad end of the duct is thrown like a mantle over the egg at the moment of its escape, and in this way it is secured against loss and enters the orifice of the tube.

The *Uterus or Womb* (fig. 4) is an irregular cavity into which the discharged ovum is conveyed by the Fallopian tube to be fertilised and afterwards nourished during fœtal development. It is situated in the cavity of the belly beneath the loins, and is held in position by two broad ligaments which suspend it from the spine. Anatomically considered, the uterus is divided into a body; two branches, termed cornua or horns; a cervix or neck; and the *os uteri* or mouth. The mouth is

the opening by which the cavity of the uterus communicates with the vagina, and through which the fœtus escapes in the act of parturition. The neck is the constricted portion situated immediately behind the mouth. Beyond this is the body, or cylindrical portion of the organ, extending forward, and dividing into two long branches or horns. These latter curve upwards towards the spine, and each communicates by a small orifice with

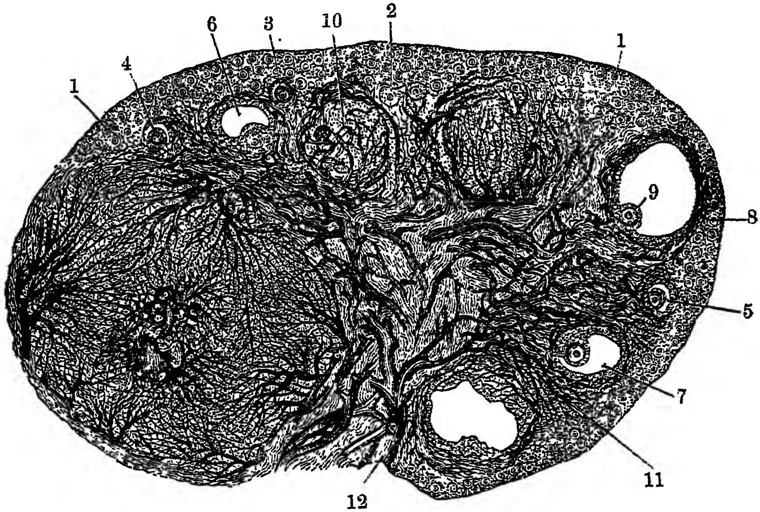


FIG. 1.—Section of the Ovary.

1, Small Graafian vesicles; 2, Larger Graafian vesicles; 3, 4, 5, 6, 7, 8, Vesicles in various stages of development; 9, Ovum *in situ*; 10, Non-ruptured vesicle surrounded by a network of blood-vessels; 11, Connective tissue in which the vesicles are imbedded; 12, Blood-vessels entering the ovary to break up as shown into a number of branches.

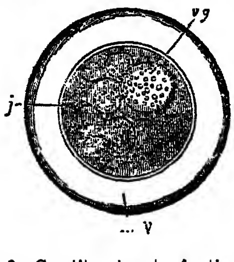


FIG. 2.—Constituent parts of entire Ovum.

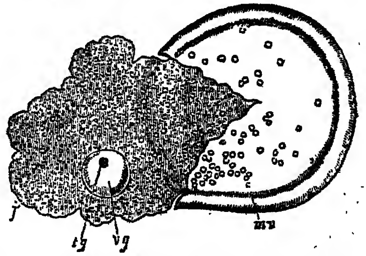


FIG. 3.—A Mammalian Ovum ruptured, with the contents escaping.

mv, Vitelline membrane; *j*, Yolk; *vg*, Germinal vesicle; *tg*, Germinal spot.

the Fallopian tube. The lower surface of the uterus is in contact with the bladder, while the upper surface is in apposition with the rectum. It is important to recognise these two facts, inas-

much as undue fulness of the bladder or the rectum, or both, at the time of delivery, may impede the passage of the fœtus. Structurally, the uterus is made up of three layers :—

1. The outer, or serous layer.
2. The middle, or muscular layer.
3. The inner, or mucous layer.

The serous layer is a thin, transparent membrane which not only covers the uterus, but more or less completely invests all the abdominal organs. It is lubricated and kept constantly moist by a watery secretion of its own, by which its smooth surface is permitted to move over the adjoining organs and parts with the least possible friction.

The muscular layer is much thicker and stronger, and forms the chief bulk of the uterine wall. The muscle of which it is composed is of the involuntary order, and is arranged in layers of fibres. The superficial, or outer layers, take a longitudinal direction, while the ones within them are disposed in circles During pregnancy the muscular fibres of the uterus are very considerably augmented, both in size and number, in order to allow the organ to enlarge for the accommodation of the fœtus without becoming unduly attenuated, and ultimately to assist by their contraction in expelling the fœtus in the act of parturition.

The mucous layer is a thin vascular membrane of a pale pink hue. In this respect, however, it varies with the state of the organ, and in the impregnated womb becomes not only much thicker, but of a deep red colour, while at the same time the vessels are largely increased in number and in size, having now to furnish not only materials for the nourishment of the young, but to provide, in addition, a constant supply of oxygen for fœtal respiration. In order that the latter may be carried on, the fœtal membranes, or "afterbirth," are everywhere attached to the inner surface of the uterus, and as the fœtal blood circulates through them, it is brought into close proximity with that portion circulating in the vessels of the parent, so that the carbonic acid contained in the blood in the one set of capillary vessels is given up to that in the other set in exchange for oxygen, with which the latter freely parts.

The *Vagina* (fig. 4) is a membranous canal of some considerable capacity, extending from the neck of the uterus backward to beneath the anus, where it ends in a vertical opening—the vulva. It is by this opening the urine escapes after leaving the bladder. In the act of copulation the vagina receives the organ of the male, and through it the fœtus escapes in the act of parturition. Figs. 1 to 4 are from Chauveau's "Comparative Anatomy."

PUBERTY.

When the organs of generation have arrived at maturity and become capable of exercising the reproductive function

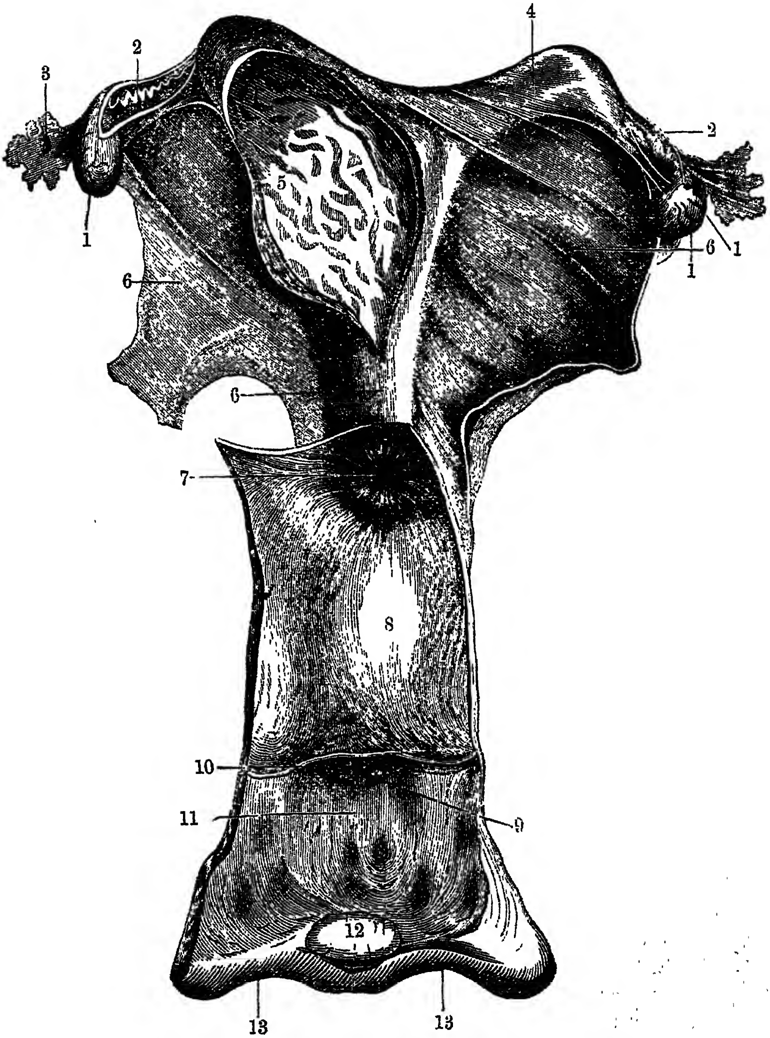


FIG. 4.—Generative Organs of the Mare, Isolated and Partly Opened.

1, Ovaries; 2, Fallopian tubes; 3, Fimbriated extremity of Fallopian tube, with opening for entrance of ovum in the centre; 4, Cornu or horn of the uterus entire; 5, Cornu or horn of the uterus laid open; 6, Broad ligament by which the uterus is suspended; 7, Cervix or neck and mouth of the uterus; 8, Interior of the vagina; 9, Urinary meatus, or passage to the bladder, covered by a small fold of mucous membrane; 10, The vulva; 11, Interior of the vulva; 12, Clitoris; 13, Labia of the vulva.

animals are said to have reached the period of puberty. The age at which puberty is attained varies in different species, and, in the same species, it varies according to different circumstances of climate, food and management. In the mare a disposition to receive the horse may appear as early as at a year old, and is invariably established between that time and the completion of the second year. The duration of this propensity and the continuance of the procreative function present wide divergencies in different individuals. Some mares cease to breed at a very early period, while others continue to be fruitful until over thirty years of age.

Œstrum or Horsing.

With the advent of puberty the female begins to manifest a periodical desire for the male, in which state she is said to be at œstrum. In regard to the mare it is more commonly spoken of as "horsing," or being "in use" or "in season." In ordinary circumstances this condition appears only in the spring and summer months, when it recurs at intervals of about three weeks, and continues each time for a period of two to three days, but in this respect great variations are noticeable in different animals. In some exceptional cases it appears and disappears in twenty-four hours, while in others it may continue for five or six days. The appearance of œstrum is a sign of the ripening and escape of an ovum from the ovary or egg-forming gland, and is attended by considerable excitement of the sexual organs. The manifestation of its presence is marked by an irritable and restless state. The mare whinnies and shows an irrepressible desire for the male. The coat stares, and there is a slight rise of temperature—which, however, soon subsides—and the appetite becomes more or less subdued. The genital parts, especially the vagina and vulva, are swollen and congested, and a discharge of a whitish glutinous secretion is frequently emitted from them. Staling is repeatedly attempted, but only small quantities of urine are discharged, and this is followed by a succession of spasmodic movements of the clitoris and vulva. Suckling mares fall off in their milk, and the quality of the secretion would seem to undergo some sort of change, as it is frequently the case that during the œstral period foals suffer relaxation of the bowels, and sometimes experience a sharp attack of diarrhœa.

In the case of mares not suckling foals the mammary gland at this time flushes and becomes somewhat increased in size. Some animals develop great excitability at the time, and kick, and

squeal, and become dangerous both to approach and to drive. It must not however be supposed that the signs of œstrum as here given will be uniformly present in all cases. Great variations may be expected to come under notice from time to time, depending in a large measure on the idiosyncrasy and bodily condition of the animal. Some mares when loaded with fat, and others of a sluggish temperament or low in flesh, may pass through the œstral period without exhibiting any striking indications of their condition, and require therefore the most careful watching in order that they may not be overlooked. It is in the writer's experience that even the closest observation may sometimes fail to detect a mare's fitness for service, and in such cases nothing short of being presented to the horse will disclose her amorous state.

The Ovum Fertilised.

If, while at œstrum, copulation be permitted, the ovum of the female becomes fertilised by the sperm elements of the male and acquires the power, which it did not possess before, to grow and, under favourable conditions, to reproduce the species. Where, however, intercourse is not allowed, the ovum, on reaching the uterus, is expelled or perishes, and undergoes disintegration and decay.

A fertilised ovum possesses no means within itself by which growth and development can be carried on to its ripening stage, and it becomes necessary, in order that it may prove fruitful, that it should be grafted on to the parent, from whose store of nutriment it can obtain the materials requisite for the building up and sustenance of its complex structure. This union of the one with the other is effected by certain changes which go on simultaneously on the outer side of the ovum and the inner surface of the womb, resulting in the former becoming intimately attached to the lining membrane of the latter (fig. 5).

Function of the Fœtal Membranes.

The medium through which this union of the fœtus with the mother is effected is afforded by the fœtal membranes, or, as they are commonly termed, "afterbirth." The fœtal membranes are three in number, and are respectively named (1) the Chorion, (2) the Allantois, and (3) the Amnion. The chorion is a highly vascular structure, the outermost of the three, and is everywhere attached to the lining membrane of the uterus. The nature of this attachment is such as to bring the bloodvessels of the young into close relation with the blood of the dam, by

which means the necessary exchanges concerned in respiration and nutrition are carried on.

To fully appreciate these facts it must be understood that the blood circulating in the body of the fœtus is constantly passing out of it through the umbilical opening or navel, and being distributed by branching vessels over the entire surface of the chorion, where, on being brought into relation with the maternal blood, through the medium of the walls of the capillaries, it gives up to it its carbonic acid, and takes in oxygen in exchange. In addition to this it also receives from the same source the materials of nutrition. With this fresh charge of oxygen and foodstuff the blood is now gathered together by the union and reunion of the divided vessels, and returned to the body of the fœtus by the umbilical vein to be again distributed through its various organs and tissues. It will thus be seen that the outer membrane or chorion is the one through which the fœtus is supplied both with food and air. The other two membranes need not be considered here, beyond stating that they form a cavity in which the fœtus is enclosed, together with a considerable amount of straw-coloured fluid. This fluid is important on account of the purposes it serves in fœtal economy—first, in protecting the fœtus from outside concussion, such as would be inflicted on the belly of the dam in passing through gates; and secondly, in warding off the effects of inside concussion, such as would result from galloping down hill. In both these cases the water softens the shock, and preserves the fœtus from injury.

But it is not only during gestation that this water proves of service in the mechanism of reproduction, for, in the act of parturition, while the throes of foaling are taking place, it forces out the membranes or "afterbirth" in which it is contained, as a bladder-like protrusion, and in so doing opens the mouth of the womb, and widens the genital passage for the escape of the fœtus. It is this water contained in its sac which, when protruding from the vagina at the time of foaling, is spoken of as the "water-bladder." More than this, it lubricates the genital passage, and thus further facilitates delivery.

Fig. 5 represents the horse embryo, natural size, at seven weeks old.[1] It is seen to be enclosed in a sac, *am*, containing fluid, and to have attached to its abdomen a short stalk, or rudimentary umbilical cord, connected with an orange-shaped sac, *y s*. These parts are surrounded by a membrane composed

[1] Fig. 5 is from *A Critical Period in the Development of the Horse*, by Professor J. C. Ewart, M.D., F.R.S., who kindly supplied the original drawing for the illustration.—ED.

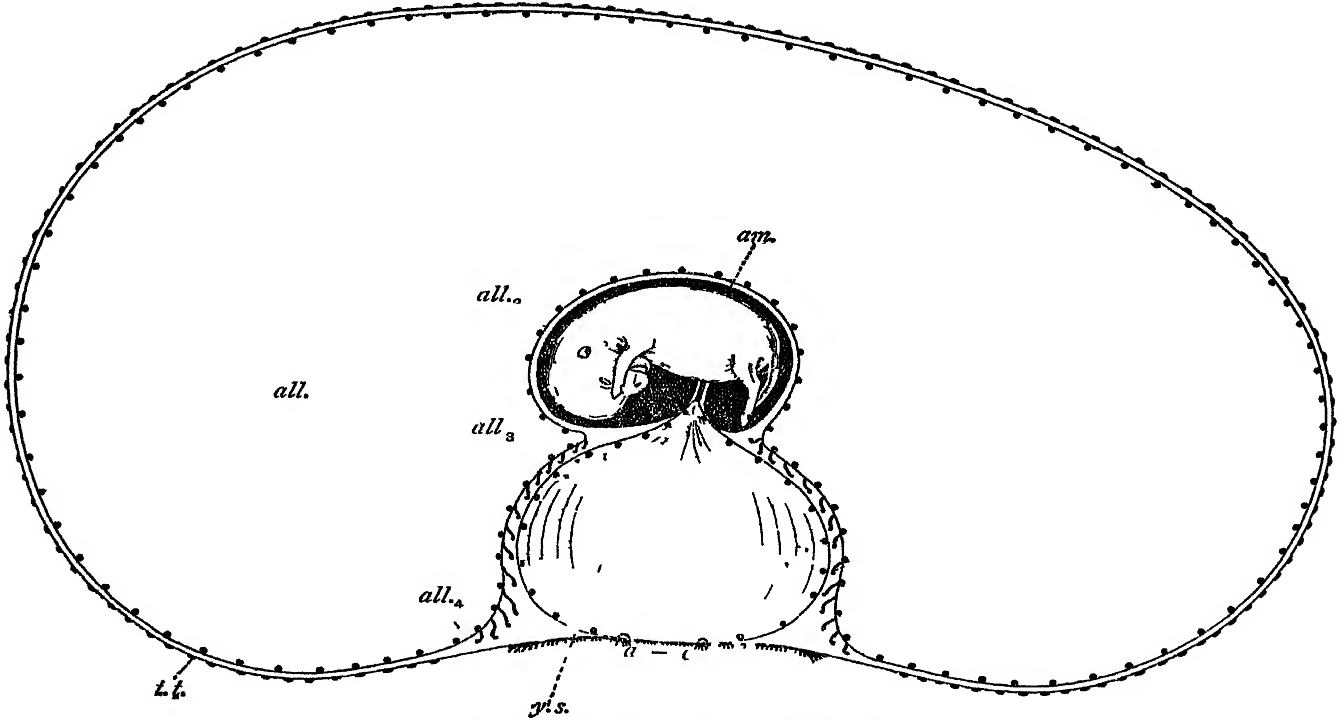


FIG. 5.—Seven Weeks Old Embryo of Horse, Natural Size

t t, Embryonic sac, *all*, *all*, *all*$_3$, *all*$_4$, Allantois, *am*, Amnion, *y s*, Yolk sac, *a c* Absorbing area

of two layers, termed respectively the embryonic sac, *t t*, and the allantois, all, all_2, all_3, all_4.

In the early weeks of gestation the fœtus is anchored on to the uterus between the points marked *a* and *c*, and by this means is enabled to draw its nourishment from the dam. The nutritive matter there obtained first enters the yolk sac, *y s*, and is afterwards taken up by the vessels distributed through its walls, and by them conveyed to the embryo.

As growth becomes more active the connection of the embryo with the uterus becomes more extensive and secure, and about the eighth week the entire surface of the embryonic sac contracts a union with the uterus by branching off-shoots which bury themselves in the mucous membrane. The blood-vessels of the former are now brought into contact with those of the latter in such way as to allow an abundant supply of nutriment to pass through the walls of the vessels from one to the other, and, at the same time, to insure the necessary supply of oxygen for the purposes of respiration.

Pregnancy and its Signs.

When the fertilised ovum has contracted a physiological union with the uterus the animal is said to be pregnant, or "in foal," and the process of gestation has begun. It is always a matter of concern with stud managers and breeders to be assured that all is well in this connection. But, although there are certain signs commonly indicating the pregnant state, they sometimes appear in such a variable and dubious manner that correct diagnosis becomes very difficult or, it may be, impossible; and this is especially the case in young mares with their first foal, who do not "let down" freely, and in old mares who have a naturally deep and pendulous abdomen, made still more so by long-continued breeding.

In ordinary circumstances, however, conception is followed by well-defined changes in the temperament and susceptibilities of the subject, as well as in the volume and form of certain parts, and later in the greater activity of particular organs. In addition to this, information may be gathered at various stages of gestation from observations directed to the movements of the fœtus as seen from without, and from explorations made by the hand within. One of the earliest, if not the most reliable, indications of conception is the cessation of œstrum, or horsing, and the mare's refusal to accept service after recent copulation. Instances to the contrary, however, have been known to occur again and again, and every breeder of experience can furnish examples of

mares returning to the horse when, according to the time when they foaled down, they must have been pregnant. Some mares, indeed, will receive the sire repeatedly after a fruitful service, but many horses will refuse to serve a mare in foal.

Another and a very notable sign of pregnancy is the marked change in temperament and behaviour. Any disposition to skittishness and irritability that may have existed disappears, and the animal becomes quiet, even approaching to dulness. Her movements, too, are less active and energetic, and she is often described as lazy. Moreover, she rests, takes food with unusual zest, and, unless unduly worked, lays on flesh. Some mares become ravenous in their feeding, and occasionally filthy. Sooner or later, the period depending on age, condition and management, an increase is observed in the size of the belly, and subsequently in its form. In this connection, young mares carrying their first foal show but little change until pregnancy has far advanced, and in some cases doubt may exist even to within a few weeks of parturition. When in regular work and receiving a liberal amount of corn, aged mares do not so soon and so obviously "let down" as do others at pasture. The snugness with which the foal is carried depends a great deal on the bracing influence of "condition." As to the form of the barrel it is noticeable, as gestation proceeds, that there is a gradual break in the uniformity of the enlargement resulting in the under surface of the belly becoming strikingly prominent with a tendency to an angular outline. This departure from the maiden form is very pronounced in some mares at an early period after conception, while in others it is only seen in the later months of pregnancy.

Should the outward signs of pregnancy not be conclusive, reliable information may usually be obtained by rectal or vaginal exploration.

Rectal Exploration.—As already pointed out, the rectum or posterior bowel is situated immediately above the uterus, so that by passing the hand into the former the contents of the latter may be felt. The anatomical relation, therefore, of these two organs renders the diagnosis of pregnancy comparatively easy, but it should be understood that for three months, and sometimes longer after conception, the fœtus is too small to be identified through the thick walls of the two organs, and often too far away in one or the other of the uterine horns to be reached by the hand of the explorer; success in this examination depends accordingly on the size and position of the foal. Even when of considerable growth it may be quite out of arm's reach, especially in some old roomy mares where it sinks to

the bottom of a pendulous abdomen. It is related, indeed, by a distinguished member of the veterinary profession that on one occasion, being called upon for an opinion as to the pregnancy or otherwise of a mare, he made a diligent and careful examination per rectum, and, failing to find the fœtus in the uterus, expressed the opinion that the mare was barren. Imagine his surprise and consternation when, three months later, he was informed that she had been delivered of a fine colt. As to the desirability and safety of this mode of investigation, it may be said that when pursued with due care, and with proper regard to the subject to be examined, it is quite free from danger, but when practised on certain excitable temperaments, or in a rough and careless manner, even in animals of a placid disposition, abortion may sometimes be induced.

Rectal exploration is an operation requiring not only nice discrimination and care, but some knowledge of anatomy as well. As a preparatory step the animal should be allowed to fast for twelve hours, so that the posterior bowel may empty itself and room be afforded for play of the hand. If the foal cannot be felt in the natural position of the mare, she may be made to stand on a sloping surface with the hind quarters lowermost, and it is also recommended by some to raise the floor of the belly by means of a rug placed beneath it, aided by an assistant on either side.

Vaginal Exploration.—Here the desired information is sought by introducing the hand into the vaginal passage, and carrying it forward as far as the neck of the uterus, which in this instance is the part to be inspected. If the womb is empty the neck will be found projecting into the vagina, while in advanced pregnancy it is shortened to the last extremity and almost entirely obliterated. Vaginal exploration, unless performed with the greatest possible care, involves considerable risk of exciting abortion, and especially in young mares and others of an excitable disposition. It is neither so safe nor so reliable as exploration per rectum, and should not be resorted to save in very special cases.

Beyond these means of diagnosing the pregnant state some observers have succeeded in hearing the fœtal heart beat through the abdominal walls of the parent. For this purpose the instrument termed the stethoscope is interposed between the ear of the listener and the flank of the mare. By moving it about from place to place, and concentrating the attention on the sounds conveyed through it, the pulsations of the fœtal heart may sometimes be heard as the subdued ticking of a watch. Many very excellent obstetricians, however, have failed to identify the

heart's beats amidst the noise and rumbling of the bowels, and under the most favourable circumstances the operation is a tedious and protracted one.

Signs of approaching Parturition.

As gestation draws to a close indications of the pregnant state become more and more striking. The belly lets down and bulges at the flanks, where the fœtus may sometimes be seen to give an occasional jump, especially after the ingestion of cold water following upon exertion. Later the udder flushes, and becomes large, full and tense, the milk ducts are plugged with a wax-like secretion, and the ligaments of the pelvis relax, producing that condition of the croup known as "dropping of the bones," "falling in at the hips," &c. Coincidently the vulva or external genital parts swell, the lining membrane assumes a red colour, and a viscid secretion is discharged from the vagina.

At the end of the term certain well-known signs of its completion are presented. Among them the mare is noticed to become restless and to cease feeding, the face wears an anxious expression, and she will repeatedly neigh and paw the ground. Urine and fæces are frequently discharged in small amount, and later on there are signs of colicky pains when she lies down and rises again. Straining now sets in, and a bladder-like extrusion appears at the vulva. This is the "water-bladder," or more properly the fœtal membranes forced out by their contained fluid which, as we have already explained, serves to enlarge the passage and prepare the way for the foal. As the throes or "pains" become more and more energetic, the protruding membranes having done their work, break, and the water gushes out in considerable quantity.

Period of Gestation.—The period of gestation in the mare is about eleven months, being sometimes a little under and at others a little over. The average number of weeks given by different Continental observers is variously stated to be between forty-eight and forty-nine. In thirty-three thoroughbred mares at the Middle Park Stud, Dr. George Fleming found the average duration of pregnancy to be 335½ days, "the shortest periods being 316 days (one instance) and 318 days (one instance), and the longest 354 days (one instance) and 348 days (one instance)." With regard to sex, statistics in this stud bore out the result of general experience, that colts are carried longer than fillies, but not to a great extent. In sixteen of the former Dr. Fleming found the average duration of gestation was 336½ days, while in seventeen of the latter it was 334.

Parturition.

Parturition is the act of giving birth, or, as it is commonly termed in respect to the mare, foaling. If the foal is in a natural and proper position the fore feet are first presented at the vaginal outlet, and these will be quickly followed by the nose resting upon the cannon bones, and then the head appears, and by a series of forcible efforts the body as a whole is gradually pressed through the passage. With comparatively few exceptions the parturient act in the mare is commenced and completed without extraneous aid. It is usually effected in a standing posture, and under normal conditions seldom occupies more than ten to twenty minutes. The fœtal membranes or "afterbirth" may escape with the fœtus, or be retained for a short period until the uterus recovers its power, when further contraction of its walls suffices to expel them. This regular course of events, however, is liable to interruption from various causes, with which the breeder of horses should be acquainted.

In natural parturition the forces engaged in the act are the contraction of the uterus in the first place and in the first degree, and the contraction of the muscles of the belly in the second. By the exercise of this primary and auxiliary force, feeble and of brief duration at first, but gathering strength and endurance with each recurring throe or pain, the fœtus is ejected from the uterus. It is on these natural efforts, supplemented by one or another of the artificial means presently to be described, that the obstetrist relies for success in overcoming impediments to birth.

Natural parturition results when the size and position of the fœtus bear a suitable relation to the genital passage, and the powers of the dam are in no way impaired by debility or disease. In the presence of these conditions no extraneous aid is called for. Perfect quiet, ample room, a clean and airy box away from the filth and noise of the crew yard, coupled with judicious supervision without unnecessary interference, are the chief requirements of the pregnant mare. As we have just pointed out, parturition in the mare under normal conditions is an act of brief duration, sometimes occupying only a few minutes and seldom exceeding half an hour. The preparatory widening of the passage for the escape of the foal is brought about by the outward pressure of the "water-bladder," and the more completely this is done the more easy will natural delivery be rendered. This fact is emphasised because the practice of "letting out the waters" before they have done their work is far too common, and cannot be too much condemned. In young

mares who have not previously borne a foal, and whose parts are in their maiden condition, this act on the part of the attendant may be followed by serious consequences both to the dam and offspring.

Difficult Labour.

As we have already seen, under ordinary circumstances the mare delivers herself without extraneous aid. Where, however, the act of parturition is unduly delayed, and the efforts of the mare fail to effect delivery, the time will have arrived when a careful examination should be made of the genital passage and the parts within it. It is most desirable that the relief of difficult labour should be undertaken early in the parturient period, while the mare is in the fulness of her strength and her throes are vigorous and prolonged. In the absence of a veterinary surgeon the person who undertakes this duty should be selected on account of his former experience, general intelligence, and tact, added to which nothing is more valuable than a long arm and a strong one. Some stud grooms and cowherds are very clever manipulators, and readily recognise the parts of the fœtus with which their hands come into contact. This is of the first importance as a means of bringing the foal into a position favourable to delivery. As a safeguard against injury to the mare the hands and arms of the operator should be thoroughly cleansed and well saturated with oil, in which a little carbolic acid has been previously mixed. The nails, if overgrown, should be cut down short, so that no injury may be done to the delicate parts within. These preliminaries over, the hand is carefully introduced into the vagina and carried forward into the uterus. After the genital parts have been examined for any possible obstruction, such as tumours, constrictions, deformities, &c., the situation and condition of the fœtus, the position of the limbs and the kind of presentation, are then to be determined. If the presentation is found to be a natural one—*i.e.*, both fore limbs and head fair for the passage—and all else besides favourable to delivery, inability to foal will be found to result either from a disproportion between the size of the fœtus and the passage, or to constitutional weakness and lack of strength on the part of the dam.

In regard to the limbs presented there should be no mistake as to their being fore limbs, nor should any doubt exist as to their belonging to the same fœtus. In certain malpositions, and in the case of twins, a hind limb and a fore limb may first come to hand, and even where two fore limbs present themselves one may belong to one fœtus and the other to another. In either

of these cases delivery would not only be impossible, but any attempt to bring it about would add very considerably to the difficulty of the situation, if it did not jeopardise the life of both dam and offspring. Whether the presentation be a forward or a backward one, the same precautions should be observed to guard against these untoward results.

Employment of Force in Delivery.

The amount of extraneous force necessary to effect delivery will depend upon circumstances. It may be only as much as a fairly strong man can alone supply, or it may require the combined efforts of two or several. Whether it be the one or the other, there are certain rules of guidance in the application of the force used that should be strictly observed.

In the first place, it should be steady, regular, and continuous—in other words, "a long pull, a strong pull, and a pull all together." Jerky and spasmodic traction is not only in a large measure force thrown away, but is actually injurious both to the dam and offspring, for in failing to co-ordinate with the efforts of the animal it delays delivery and tends to disarrange and damage the soft and sensitive parts of the passage.

Whether the force employed be manual or mechanical, it should be so timed as to commence with each throe or labour-pain as it occurs, so that the outward effort and the inward effort shall combine and operate simultaneously. So long as the mare is able to render assistance and her powers bear a fair proportion to the energy required, this rule should be rigidly observed. As to the direction which the outward force should take, this is a matter of very considerable importance. At the outset, and until the head has passed through the vulva, the line of traction should be directly backwards. At this time the withers will be entering the pelvic inlet, and in so doing tend to interfere with the onward movement of the fœtus by jamming against its upper boundary. To guard against this the traction should now be slightly inclined downward. As the shoulders come into the pelvic outlet the resistance will be materially increased, and may be best overcome by pulling first to one side and then to the other; and the same movement may be practised where, as sometimes occurs, the hips are unusually wide and drag in the passage.

Protracted labour, whether it results from disproportion of size between the fœtus and the passage, or from malposition or other causes, inevitably tends to weaken the powers of the mare and to materially discount the efforts of outside help. In this

case the strength must be upheld by the administration of stimulants, and a short period of rest must be allowed when exhaustion threatens. It should, however, be pointed out that in all cases of this kind there should be no lack of assistance present. Plenty of force early in the task, while the mare is fresh and full of energy, is of all requirements the most essential to success. Many mares are annually lost from neglect of this provision, and the protracted abuse to which it leads. Veterinary surgeons rightly complain that, if delivery is not rendered altogether impossible, the life of the mare is often jeopardised by the "pulling about" she has suffered for want of sufficient and well-directed force at the outset.

Abnormal Presentations and Malpositions of the Fœtus.

Anterior Presentations.

The obstacles to delivery are many and various. Some of them are connected with the fœtus, others with the mare, while in exceptional cases both contribute to render parturition protracted and troublesome, or even impossible. For reasons, some of which remain to be discovered, the position or form of presentation of the young to the uterine outlet, is liable to variations of an extreme character, rendering delivery not only difficult but dangerous alike to the mare and the offspring, one or both of which are frequently sacrificed in the attempt. Thus, instead of the fore feet first entering the passage as in the natural form of presentation, they are sometimes found to be turned backward and resting beneath the elbows. In this position the head is presented alone, and the tendency of the throes is to drive the bent knees into the passage, where they become wedged and immovable, or against the brim of the pelvis, where they offer an obstinate resistance to delivery. A modification of this presentation, and one more difficult to deal with, is that where the head is fair for the passage but both the fore legs are directed backwards beneath the abdomen, and the feet opposed to the flank; or it may be that one fore leg is presented with the head in a natural position while the other is carried back towards the hind ones.

The head, like the extremities, is also subject to certain forms of deviation from the normal position and direction, whereby labour is seriously protracted, and in some cases rendered impossible. Such examples will be serious in proportion to the degree and kind of displacement existing. In this connection it is found that the head may be flexed upon the neck, and doubled under the brisket, between the two fore legs

which occupy the passage ; or it may be deflected to the right, or to the left, so as to rest on the side of the chest, or still further back towards the abdomen ; or it may be carried upward and backward to the full length of the neck. In rare instances the fœtus is brought into the extraordinary and almost unalterable position of having the head and all four limbs directed towards the passage. Besides these abnormal positions of the fœtus in its forward presentations there are also others equally difficult and embarrassing to the veterinary obstetrist in the breech or backward presentations. Of these the first and most tractable is that in which the hind limbs are directed backward with the feet in the passage, and the body extended in a forward direction with the back uppermost. A less favourable position results when, in addition to a backward presentation, the fœtus is found to be lying on its back. Here delivery is attended with considerable, although not necessarily, insuperable difficulty, so long as the hind limbs are accessible, and can be brought into the vaginal passage. The chief obstacles to delivery in this position are the hocks and the croup, which may successively become jammed against the brim of the pelvis.

One of the most difficult and dangerous presentations, both as regards dam and fœtus, is that in which the croup and buttocks first approach the pelvic inlet, while the hind limbs are extended forward beneath the abdomen. A less serious, though always troublesome, form of posterior presentation results when, instead of the hind limbs being extended backwards in the line of the pelvic outlet, they are directed forwards in such a way that the hocks are flexed at an acute angle on the lower thigh, and the latter on the upper thigh.

Besides these and other malpositions of the fœtus there are also many and various malformations, the result of either disordered development or disease, which oppose and render abortive the normal efforts of delivery. Thus in the one we have the different forms of monstrosities in which the extremities, or the head, or both, are numerically in excess, or the spine is partially double. These forms of obstruction are much less frequently met with in the mare than in the cow, but when existing they form serious obstacles to delivery, and the life of the mare will often depend on their being early discovered and promptly dealt with.

Obstructions, the result of disease, are seen more especially in those cases where the head or the abdomen of the foal is increased in volume by the presence of large quantities of fluid, constituting in the one case hydrocephalus, or dropsy of the brain, and in the other dropsy of the belly. Moreover,

a universal dropsy of the entire body may exist and render parturition impossible without expert help. Besides deformities and diseases of the fœtus, birth may be more or less interfered with by excessive general development, when the fœtus is found to have grown out of proportion to the dimensions of the genital passage. In this connection Dr. Fleming observes there are instances recorded of the fœtus of the cow and mare weighing 117, 165, and 189 pounds. It may therefore be readily understood that the greatly exaggerated volume which this weight represents must meet with much resistance in passing through a canal which in ordinary circumstances gives exit to a fœtus weighing from 56 to 80 pounds.

Impediments not less serious than those which appear in the fœtus may also occur in the dam. Of the latter, some are physiological and others structural. Of the first kind illustrations are found in those cases where, as a result of general weakness or exhaustion, the expulsive efforts of the parent are altogether insufficient to effect the discharge of the fœtus. The mechanical impediments resulting from disease, deformity, and displacement of the maternal parts are too many and varied to allow of more than a bare reference to examples of the several groups. As a whole they represent a source of considerable trouble and loss to the breeder, but they cannot be said to be of frequent occurrence individually. In the matter of disease, obstruction to delivery may be induced by tumours affecting the pelvis, or others growing in or out of the walls of the uterus or the vaginal passage, in rare instances also in the cavity of the bladder. Rigidity of the neck of the uterus as the result of past injury is also among the causes of difficult parturition arising out of disease. Deformity of the maternal organs finds expression in the bones of the pelvis, either as a congenital condition or as a consequence of fracture or some such deforming disease as rickets. It has also been observed that the uterus, for reasons but little understood, sometimes, though rarely in the mare, becomes twisted on itself in such manner and degree as to occlude the outlet and prevent the escape of the fœtus. The pregnant uterus is also liable to displacement when, as in rupture of the walls of the belly, it loses its natural support, and, falling from its place in the abdomen, remains suspended by the skin.

From a consideration of the foregoing references and illustrations the breeder will realise, as he may not have done before, the difficulties which beset the path of the veterinary obstetrist, and the danger incurred by delay in seeking his assistance and advice.

Rectification of Abnormal Presentation

It would be impossible in the space allotted to this paper to consider all the various forms of malposition in which the fœtus may be found, but a brief reference to the more common ones may be of practical service to those engaged in stud management. In fig. 6 is depicted an anterior presentation, with the fore limbs flexed at the knees and the head fair for the passage. To effect delivery in this case it is necessary to secure the legs and to bring them into the position of a natural presentation—*i.e.* beneath and in advance of the head of the fœtus. For this purpose the cannon bone must be straightened

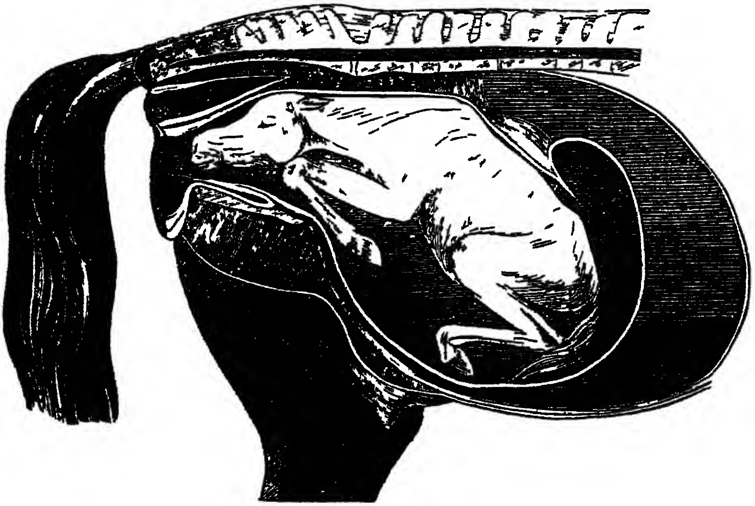


Fig. 6.—Anterior Presentation. Head lying in the Passage.

on the knee and the leg extended. Whether the right or the left limb should be first dealt with must depend upon its position. That one which is most easy of access and may be recovered with the least trouble is the one to be preferred. Where the head occupies the passage, it will require to be pushed back by planting the flat of the hand in front of the face. If a further backward movement is required, it may be effected by means of a crutch applied to the front of the chest. At the same time the hand is carried along the under side of the neck, until the forearm is reached and grasped, and after being pushed as far as may be required in a backward direction, it is then raised upward, so that the leg may be brought bodily forward. The

cannon is now seized, the knee is pushed up towards the neck, and the hand, drawing the limb forward, gradually moves towards the pastern, which it grips, and after bending the fetlock-joint draws the foot carefully into the passage. The limb should now be secured by cords and the recovery of the next one proceeded with, after which delivery may be effected in the usual way.

As already pointed out, a more difficult presentation is met with where, as in fig. 7, the head is presented and the fore-limb or limbs are carried back beneath the abdomen towards the flanks. Here the advantage of a long arm and a strong one will be plainly obvious, for the success of the operation in this,

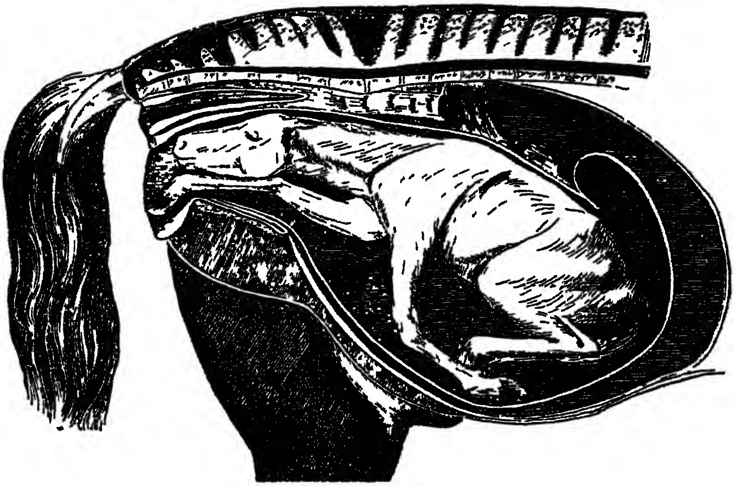


FIG. 7.—Anterior Presentation. Head and One Fore Limb in Position.

as in the case last referred to, will depend upon the forelegs being secured and brought into position. If the head is in the passage, it must be put back; the hand is then passed along the under part of the neck until the forearm is reached, and brought up as before. Failing to accomplish this, a backward direction may be given to the foal by underpacking the forefeet of the dam with litter, so as to raise the front of the body. When the fore-arm is secured the hand should be passed downward as far as possible towards the knee; a good hold of the limb is then taken, and while the lower end of the arm is being raised to the pelvic inlet, the upper end will be forced backward. At this time it may be desirable to push the body of the fœtus back into the uterus with a crutch implanted against the breast, so as to make room

for the further upward and forward movement of the leg. As the limb comes towards the pelvis the hand will now seize the shin and proceed to bring the foot into the passage, as described in the last presentation. Should it occur that the arm cannot be grasped, either from its not being sufficiently within reach or from cramp or fatigue on the part of the operator, an attempt should be made to pass a cord round it by means of a suitable instrument, as shown at fig. 20, p. 213. In its absence a small hooked walking-stick, carrying a cord through a hole in the handle, may be used, and while the limb is being acted upon by assistants the operator will engage himself in raising and guiding it into position.

Malposition of the Head.

Downward deviation of the head presents itself in various degrees, from a slight bending upon the neck to that extreme

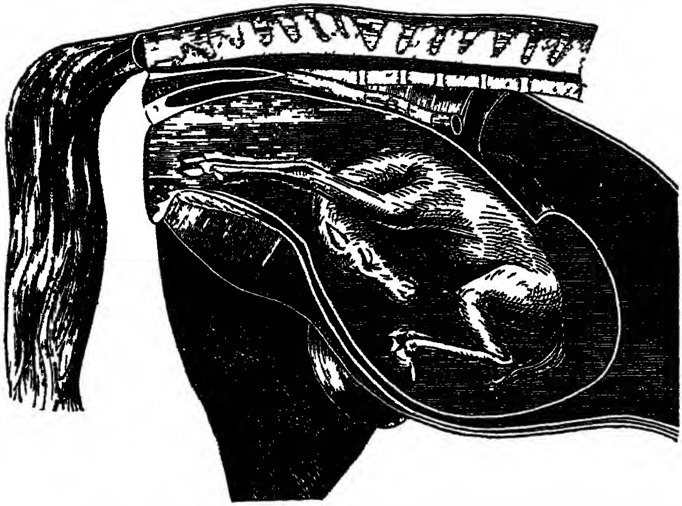


FIG. 8.—Anterior Presentation. Fore Legs in Position, Neck bent downward on itself.

condition of displacement depicted in fig. 8, where the head is doubled under the body, while the neck is presented to the pelvic inlet and blocks the way to delivery. The difficulty attaching to this and other deviations of the head arises out of the great length of the foal's neck, which allows it to be carried out of reach. In the matter of adjustment, the trouble to be encountered will be in accordance with the degree of backward displacement. This may be no more than to bring the nose

against the brim of the pelvis, but sufficient to interfere with natural delivery. Here it is only required to introduce the hand into the uterus, and on reaching the nose to carry it round the chin, or pass the fingers into the mouth and by a steady pull raise the head into the passage and complete delivery in the usual way. When, however, the head is situated deep down under the brisket, and the poll is firmly fixed against the pelvic brim, or the neck encroaches on the passage, the task becomes both difficult and embarrassing. In this position rectification will be assisted if the hind-quarters of the dam are elevated by under-packing with litter, so as to give the fœtus a downward inclination. Should the neck present itself to the passage, the

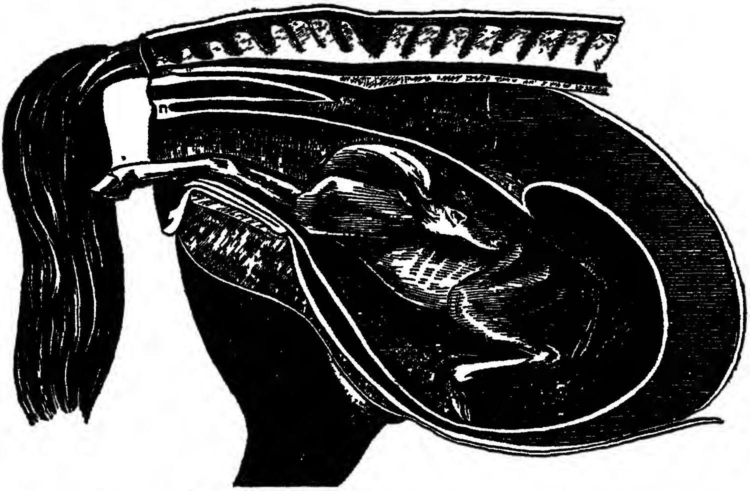


FIG. 9.—Anterior Presentation. Fore Legs in Position, Head and Neck deflected to the Left.

body will require to be forced backward by means of a powerful arm, or, failing in this, crutches applied to the front of the shoulders in order that room may be provided for the forward movement of the head. To raise the latter, advantage must be taken of such parts as come within reach to which traction may be applied. Thus, the ears will be first accessible, or blunt hooks or crotchets may be anchored on to the orbits, or passed behind the lower jaw, or into the angle of the mouth. If capable of adjustment, a cord round the neck may also afford assistance. It should be borne in mind that in attempting to rectify this form of presentation, the backward force applied to the body should be exercised simultaneously with that acting upon the head. Mechanical ingenuity, tact, anatomical know-

ledge and discernment are all necessary in dealing with this difficult form of presentation.

Lateral displacement of the head (fig. 9) may be either to the right or to the left. The head may be simply bent upon the neck, or the neck may be bent upon itself and the head carried backward to the side of the shoulder or the chest, or descend towards the floor of the uterus. In whatever degree the deviation may exist, the presentation is at all times difficult and often an impossible one to correct. Especially is this the case with the foal, for reasons already stated. Referring to this form of displacement, Dr. Fleming observes: "The principal aim is of course to get hold of the head, adjust it, bring it into a favour-

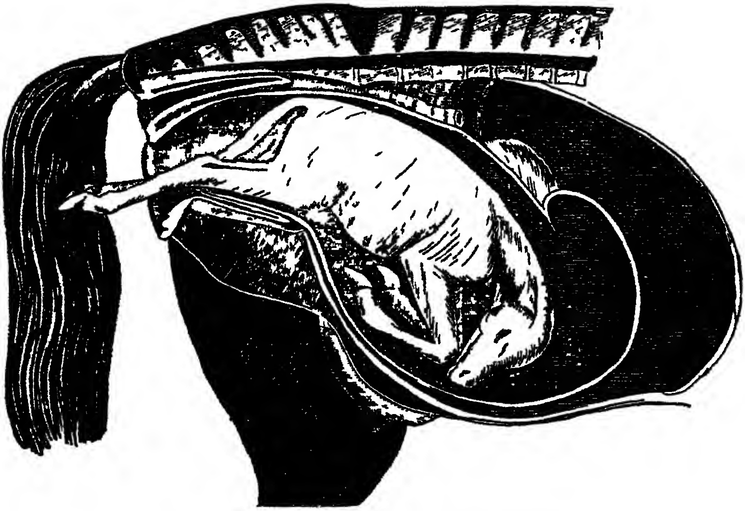


FIG. 1[illegible].—L[illegible] Presentation [illegible] Legs Fair for Delivery

able position in the genital canal, and then terminate delivery. But this indication cannot always be carried out, especially when the head is beyond reach. With regard to adjustment, the better plan appears to be as follows. Cord the presenting fore-feet, push the fœtus into the uterus so as to clear it from the inlet, pushing either on the flexed neck or chest, and not directly forward but rather obliquely to the side opposite that to which the head inclines, so as to bring this round to the inlet. If the fore limbs are in the way of the operator they may also be pushed back into the uterus. The head is then to be sought for and twisted in such a way as to bring its under surface uppermost." To effect this latter change requires an

amount of dexterity in manipulation and in the use of mechanical appliances only possessed by the experienced accoucheur, and when professional assistance can be obtained it should not be attempted by the amateur.

Posterior or Breech Presentations.

In this form of presentation the more common obstacles to delivery arise out of the position occupied by the hind extremities. Where, as in fig. 10, they are extended in the passage, and the croup of the fœtus is in apposition with the spine of the dam, delivery is most favoured, and although this

Fig. 11.—Hock Presentation

may be effected by the natural efforts of the mare, such cases should always receive prompt assistance when the necessity arises. There is nothing here in the matter of position to rectify. All that is necessary is to aid by force, as may be necessary, the expulsive throes of the dam.

Very different is the case of what is known as hock presentation (fig. 11), when, instead of the feet being projected into the genital canal, as in the presentation last referred to, they are carried beneath the belly, while the hocks occupy the passage, or they, together with the breech, are jammed in the pelvic inlet. In the latter condition especially the obstacle is always a formidable one, and in the mare frequently insurmountable. To effect delivery requires that the hind limbs shall

be brought into the genital canal and fully extended. Before this can be done, however, the necessary room must be provided by forcing the buttocks of the foal away from the passage. Here, again, some assistance will be derived from raising the hind-quarters by under-packing with litter or other means. By thus giving the body of the dam a downward inclination from back to front, the foal will more readily respond to pressure from behind. This may be applied either with the hand, or a crutch (fig. 12) brought to bear steadily but persistently upon the buttocks a little below the tail. The intervals between the throes or straining should be chosen for action, when there is no resistance to the forward movement of the fœtus into the uterus. When the passage has been sufficiently cleared an attempt must be made to recover the legs, and bring them one by one into position. To do this the palm of the hand should be planted against the under side of the point of the hock, and the second thigh forcibly pressed in an upward and forward direction. If a cord is now passed round

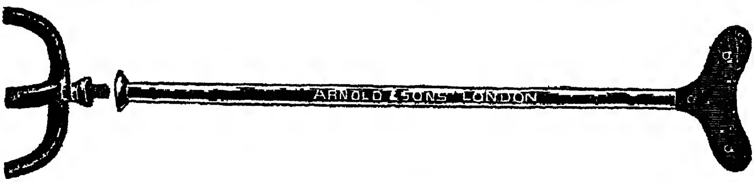


FIG. 12 —Crutch or Repeller.[1]

the hock, and handed to an assistant, the limb may be steadied in position, while the operator, grasping the shin bone, will, with outside assistance, draw the leg towards the pelvic inlet. As progress in this direction is made the hand is to be moved along the cannon towards the fetlock joint. The foot is then seized and the pastern forcibly flexed, and the leg lifted into the passage and extended. When the buttocks by being forced back towards the passage again interfere with adjustment of the legs, the crutch or repeller must be brought into use, and it may also be desirable to carry the cord down to the pastern when additional force is required.

Still more difficult and dangerous is the presentation given in fig. 13. This position, at all times serious, is rendered even more so by the throes of the mare, which tend to push the presented parts backward into the passage and to force the hind legs forward beyond the reach of the operator. Early recogni-

[1] This form of repeller is used when it is required to bring force to bear on the buttocks, in which case the centre-piece is passed into the anus.

tion, therefore, of this malposition is of the first importance, and the absence of any appearance of the feet in the passage should lead to prompt exploration of the fœtus and the engagement of professional help. The difficulties to be overcome in this form of presentation are very considerable at all times, and often insuperable. With the croup wedged in the pelvic inlet and the hocks beyond reach, the chances of readjustment and delivery are remote. Here, as in the last position referred to, the body of the foal must be forced into the uterus by means of the repeller, and the passage cleared for the upward and backward movement of the legs. An attempt should now be made to get a cord round the hock by means of the curved

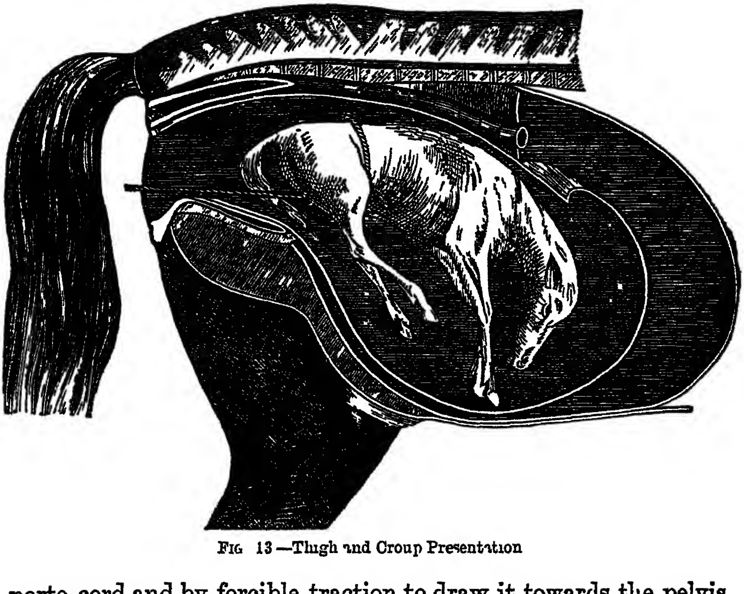


FIG. 13.—Thigh and Croup Presentation.

porte-cord and by forcible traction to draw it towards the pelvis. Where this can be done the further course of action would be such as we have described in dealing with the case last referred to. In some few instances where the hind limbs could not be recovered, delivery has been effected without change of position. This requires either to pass a cord round each of the thighs and draw it up to the flank or to fix one round the body, as shown in fig. 13.

Equally difficult and dangerous are the presentations depicted in figs. 14 and 15. In the former no parts have entered the passage, but the neck is presented to the pelvic inlet, while the head and fore-limbs are carried backward beneath the body.

In the latter the passage is occupied with both the fore and hind limbs, as well as the head. It need hardly be said that the rectification of such formidable malposition should only be attempted by the expert. The various illustrations of malpresentation are from Lehndorff's "Handbuch fur Pferdezuchter."

MECHANICAL AIDS TO DELIVERY.

It would hardly be possible, in the space allotted to this article, to consider the many and various devices—mechanical, medical, and surgical—which the veterinary expert employs, in correcting and removing the numerous and varied forms of

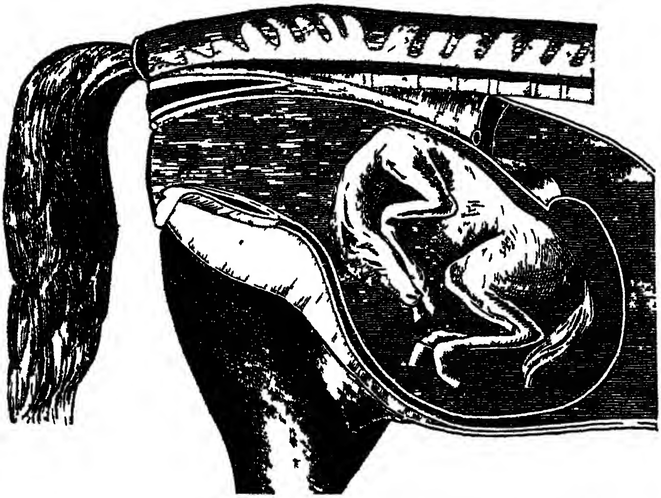


FIG. 14.—Anterior Presentation. Head and Fore Extremities turned back.

obstruction which complicate and oppose delivery. There are, however, certain devices and general principles of action with which all who are in any way concerned with horse-breeding should be acquainted, and which may here be briefly considered.

As we have already seen, the fœtus may present itself to the genital passage in a variety of ways, all tending to render delivery difficult, and often dangerous to both dam and offspring. To bring about a rectification of these malpositions and presentations with reasonable despatch and safety requires not only a knowledge of anatomy and physiology, but a large and varied experience of the technique of obstetrics in which the manipulation of the parts, and the selection, adjustment, and use of instruments and appliances, are of the highest importance.

These are qualifications which cannot be imparted by any written description, but must be acquired by experience and practice

When the position of the fœtus has been determined and the

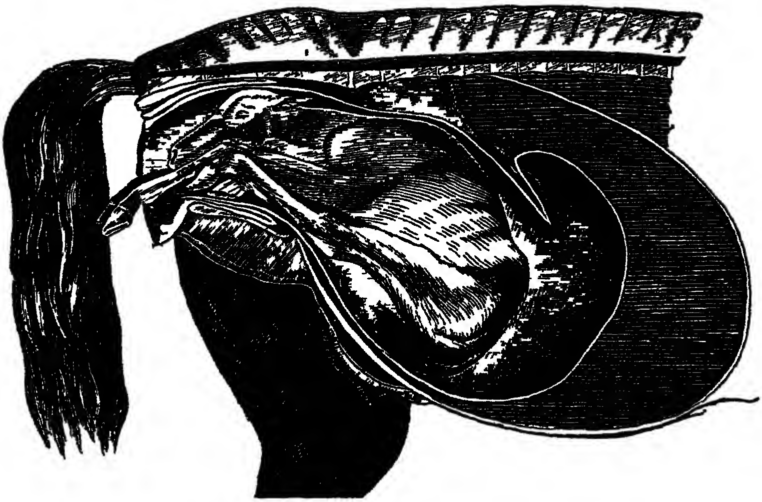


Fig 15—[illegible] Presented

necessary change in the whole or any part of it has been decided upon, the mode of procedure will require to be considered In

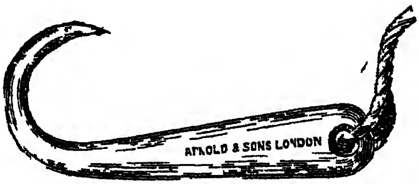


Fig 16—Sharp Crotchet

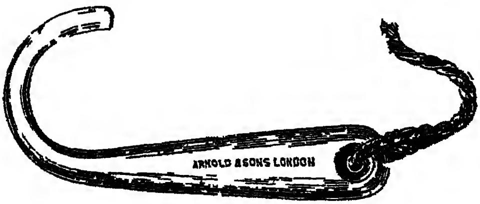


Fig 17—Blunt Crotchet

the first place rectification of malposition will be attempted by means of the hands alone, and, failing this, one or more of the various appliances employed in obstetric practice will be resorted

to. In addition to ropes and cords, these comprise sharp and blunt pointed hooks (figs. 16 and 17)—some attached to ropes, and others fixed to handles—crotchet-forceps (figs. 18 and 19), pulleys, and other mechanical aids to delivery. Nor must it be forgotten that considerable assistance may sometimes be derived from placing the body of the mare in certain special positions. In one case, as we have seen, it may be necessary to raise the hind quarters, so as to throw the fœtus forward, while in another the opposite attitude is required to be enforced.

As to the means of effecting these changes of posture, much will depend upon the extent to which they are needed. A con-

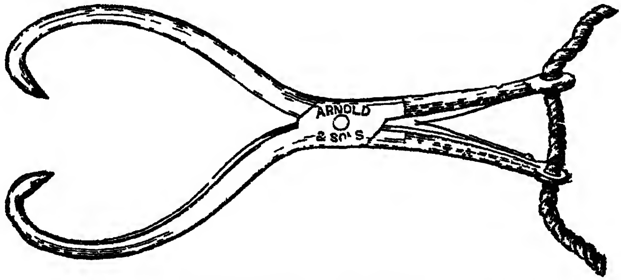


Fig. 18.—Pointed Crotchet Forceps.

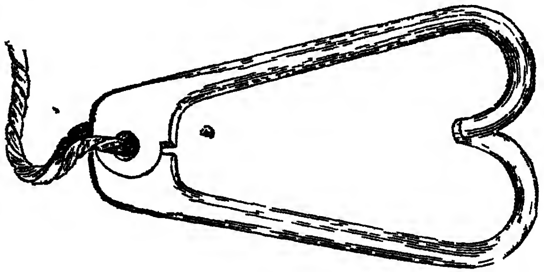


Fig. 19.—Blunt Crotchet Forceps.

siderable inclination either one way or the other can be given to the body by underpacking the fore or hind legs respectively with litter; but where it is required to give the hind quarters a distinct upward tendency—which, by the way, seldom occurs—pulleys acting from a beam will need to be resorted to. In the employment of mechanical appliances for the purposes of delivery, it is of the first importance that the operator should make himself acquainted with the parts that most readily and usefully lend themselves to bring the whole into proper position; and it should be an invariable rule of procedure, where help of this kind is needed, to secure with

ropes or other means all parts, whatever they may be, which first present themselves in the passage. By adopting this course the operator is at liberty, while deciding as to what parts are to come first, to return any one or all of them into the uterus, with the assurance of again recovering them should necessity arise. Moreover, where the head is thrown to one side and nothing but the fore legs present, it may be desirable to put the legs back until the head is brought into position. In such-like cases, the legs, having been secured, may be brought into the passage at any time, whereas if unsecured they may pass out of reach, or be forced during the throes of the dam into some difficult position, in recovering them from which much time would be lost. The body and extremities of the foal offer many points for the adjustment of ropes, cords, and hooks as means of traction. When the head is accessible, a light headstall may be applied to it; or a stop noose may be put round the neck, or a running noose introduced into the mouth and carried over the poll, or a cord may be affixed to the lower jaw, and so on, according to the requirements of the case and the facilities which offer for adjust-

FIG. 20.—Porte-Cord.

ment of the one or the other. It should, however, be observed that while the head forms a most substantial base for the application of force, the lower jaw is likely to be severely damaged, or even broken, unless the amount of traction applied to it is judiciously regulated.

Besides the use of ropes, there are certain parts of the head into which hooks may be fixed, after other and less heroic means have failed to secure a hold. If, for example, the head be turned back, and the angle of the mouth cannot be reached by the finger, a blunt hook mounted on a suitable rope or handle may be pushed forward, and anchored on to the cheek. In difficult cases, when the last-named part cannot be reached, the orbit of the eye will afford a favourable point into which to insert the finger or a blunt hook, or in difficult cases even a pointed one may be employed. Should the latter be adopted, the amount of force used must be carefully graduated, or the instrument will be made to tear out and may seriously damage the uterus. In fixing hooks into the orbit care should be taken not to injure the eye, unless the foal

is dead or the mare in danger, when no consideration of this kind should influence the operator.

When the hind part of the body is presented, and the posterior limbs are advanced beneath the belly of the foal, ropes may be passed between the legs and brought round the thigh, or the bend of the hock, or both in succession, as progress is made in raising the limbs towards the natural outlet. For this purpose various forms of porte-cord are used, of which the one shown in fig. 20 is perhaps the most useful.

Double hooks or crotchet-forceps, blunt or pointed as may be required, may also be brought into use, both in anterior and posterior presentations, when no sufficient hold can be secured by any other means. These instruments may be made to penetrate the tissues and take a firm hold of deep-seated tendons, or be anchored on to bones and ligaments. Equally useful in the rectification of abnormal presentations are the various forms of repeller or crutch (fig. 12, p. 238), by means of which the body of the fœtus as a whole may be pushed back, in order to make room for the advance of misplaced extremities, and to secure them by means of ropes or other appliances.

In connection with mechanical aids to delivery, it remains to be said that in their employment the strictest regard should be paid to cleanliness, and all ropes and appliances used for parturition purposes should be well scalded and disinfected.

The Treatment of Brood Mares.

Early Mating of Mares.

The perennial question as to the age at which mares should commence their stud career is as green to-day as it was thirty years ago, and there are plenty of men of large experience who believe and act upon the dictum that the "dictates of nature" should be promptly complied with, and that at the early age of two the mare should go to service. To this suggestion there can be no objection if the breeder has no desire to enter the race for supremacy, and has no ambition to produce a "horse of the century," or add to the excellence of the general stock. It is urged by those who practise this system of early mating—and who does not?—that it is economical, since at a period when young mares must perforce lead a more or less idle life they may by this means be made to yield some immediate return for the outlay bestowed upon them. This is perfectly true, and it is hardly to be expected that consideration for the higher principles of breeding will be allowed to stand in the way of that narrow but urgent margin of profit obtained by the average breeder.

There can be little doubt that mares born early in the year and well forward in growth at two years old are much less retarded in development at this time, and more likely to produce a good foal, if well done, than others less favourably situated; but the fact remains that the practice is not conducive to the best interest of our horse stock, and the writer has no hesitation in affirming that in respect to size, frame, constitution and bone, it is distinctly prejudicial. It is not contended that mares at this age do not now and again breed horses of the highest class. Instances to the contrary are to be found in every breed.

Among others of the Shire breed, for example, is that grand horse Bury Victor Chief, who was the produce of Bury Daisy at three years old. Among the Hackneys, Garton Duke of Connaught, Langton Duke, Langton Performer, Vigorous, Astonishment, Orange Blossom, and Dorothy Derby II., are all out of three-year-old mares. But these and such other examples as are to be found form a very small proportion of the total of good horses of the respective breeds, and include a still smaller proportion of the best. While recognising, therefore, the possible and occasional success of early breeding, such statistics as our various stud-books afford will, I believe, lend no sort of encouragement to the practice, if they do not actually condemn it.

To say when a mare should not be put to the stud does little to advance the argument, and leaves the question very much where it was. It remains, therefore, to indicate at what age this may be permitted with the greatest prospect of success in the production of the best and the improvement of the whole. In this connection we might point to mares in every variety who have produced high-class horses when stinted at three years old, and still more who have given us produce above the average at the same age; but a full consideration of the question warrants the conclusion that the best results would follow were mares allowed to commence their stud career a year later. At this period growth is drawing near to completion, the organs of reproduction have acquired size and stability, and the physiological energy hitherto engaged in building up the frame may now be more largely devoted to maturing the fœtus. At the present time, when want of size in our working horses is so universally recognised, breeding from babies can hardly be regarded as a commendable practice.

When Foals should Fall.

To so regulate the mating of mares that the foals shall be dropped at a suitable season is a matter of the greatest concern

to the breeder of horses. In these days of horse shows, with their numerous and costly prizes, medals, and challenge cups, great temptation is offered to the breeder of pedigree stock to strive after early produce, and to resort to a system of forcing and pampering which, while productive of a limited and temporary success, cannot be otherwise than disastrous to the general well-being of the horse. As to the particular month of the year when foals should be encouraged to come, a great deal will depend upon the soil, locality, and climate in which they are to be reared, and, naturally, opinions on this question vary with the variations of experience gained under different local conditions. In a climate so uncertain and trying as ours, early foaling is distinctly prejudicial to the life and health of the offspring, and it is not too much to say that a large share of the loss and disappointment that breeders experience under ordinary conditions is due to this cause. Some consider the advantage of an early colt to be a good set-off against the risk entailed, and the latter part of February or the beginning of March is the time arranged for foaling to commence. With the prevailing winds from the east or north-east at this season of the year, cold rains and snowstorms, little sunlight, and a scanty supply of rank herbage, both mare and foal must either be subjected to confinement for several weeks, or face the rigours of the season and attendant risks. Nothing conduces so much to the health and well-being of the dam, and to the growth and stability of the foal in the first period of its life, as an abundance of spring grass and the vivifying influence of the solar rays. These desiderata cannot be hoped for as a settled condition until the month of April has well advanced, and it is from this time onward, through May and June, that the best and strongest foals will be dropped and most successfully reared. The best food that can be procured, and the most perfect stable and management that can be designed, are poor substitutes for the liberty, pure air, and rich, succulent herbage of advanced spring.

Foals dropped late in the summer are at an equal disadvantage with those that appear too early. The grass at this time is losing its goodness, and the milk of the dam is indifferent both in quantity and quality. Besides, the nights are getting cold and damp, and, worse than everything, the youngster will be shedding its coat at a time when it should possess its winter suit. All this tends to lower the vitality of the individual, to check growth, and enfeeble development. If foals are to grow, and shape, and make good horses, they must bask in the sunshine of summer and receive an abundant supply of the rich milk and ripe herbage it affords. Moreover, growth, to be

attended with substantial development, must be continuous, and uninterrupted by the poverty and inclemency of both spring and autumn.

Management of In-Foal Mares.

Not the least important branch of stud management is that which deals with the care and protection of mares during the period of pregnancy, and it is not too much to say that a considerable percentage of the sickness and mortality ordinarily prevailing in our breeding-studs results from causes of a common and preventable character. Of these some are especially conspicuous, and perhaps none more so than the prevailing and rapidly extending system of undue feeding, fattening, and pampering which mares of the heavy breeds especially are subjected to in the course of their show career. This is an evil so obvious to everyone concerned in horse-breeding, and so universally admitted by all, that neither evidence nor argument is called for here. Were it otherwise, ample testimony would be found in the stud-books of our heavy breeds. Here it is clearly shown that the productiveness and breeding merit of our great champion mares stand at an almost irreducible minimum, and the limited number of successful produce among their offspring is such as to leave no doubt as to the pernicious effects of the "getting up," and "letting down" to which they are subjected in the course of their show career The obesity in which the great bulk of our show mares are found during the exhibition season is a state altogether inconsistent with the exercise of the full measure of their productive powers. With every organ in the body encumbered with fat and impeded in function to the verge of disease, it would be strange indeed if the fœtus did not suffer in point of size and constitution. Nor does the mischief of this injurious practice end here, for the danger to both dam and foal where any impediment to parturition arises is multiplied many fold,—firstly, by diminishing the room naturally available for the passage of the fœtus; and secondly, by lowering the vitality and strength of the dam, and adding to the difficulty of delivery. It is not only in its immediate effects that this practice proves hurtful but, long after it has been discontinued, sterility, or a disposition to abort—one or the other—is often left behind, while the capacity to reproduce, in the offspring, that vigour of growth and frame which characterises the parent is frequently weakened beyond recovery.

Good general health is unquestionably the bodily condition most conducive to productiveness in the dam and growth in

the young, and this state can only be acquired and maintained in its fullest measure by a judicious system of liberal feeding and apportionment of suitable work. It must, however, be recognised that while the former may, and should, be within the reach of all who aspire to horse-breeding, the latter is for obvious reasons impossible of universal adoption. Mares kept exclusively for breeding purposes lead a life of idleness—in what is usually, but erroneously, regarded as a natural state. As to pasturing brood mares much might be said, but it will be sufficient to note the chief points in which it may fail of success. Not the least important of these is the nature of the country. Steep hills and rough ground should certainly be avoided, and especially so where the mares are big and roomy, and in all cases when pregnancy is far advanced. Very naturally, to any suggestion of this kind may be opposed the condition of mountain ponies. Mountain ponies, however, are neither big nor roomy, nor are they highly bred, or highly fed, or highly domesticated. Their susceptibility to outside impressions cannot be compared with that resulting from the long years of cultivation and artificial treatment of our improved breeds. Besides, there is no evidence to show that even these denizens of the mountains do not suffer as breeding animals from the physical conformation of the country they inhabit.

Of still greater importance to the well-being of the brood mare is the nature of the soil from which she draws her sustenance. That best adapted to stud purposes is such as will neither fatten nor starve, but supply a steady growth of herbage of a sound and nutritive character throughout the greater portion of the year. Low-lying, damp situations, where the grass comes sour and rank, where the soil is wet, and dense fogs prevail in the cold nights of spring and autumn, are alike conducive to abortion and prejudicial to health. At all times the winter grazing of pregnant mares needs considerable care and attention on the part of the manager, and the resort to dry, nourishing diet should not be too long delayed. As to when it should be commenced will depend upon the nature and quality of the herbage, the size of the pasture, the number of stock upon it, the state of the season, but above all upon the condition of the mares. The last-named should never be allowed to get low. Poverty on grass is the worst form of poverty, not only because it is usually attended with exposure, but also because of the tendency which the cold, indifferent herbage of the autumn and winter possesses of lowering the temperature of the body. This kind of treatment not only predisposes to abortion, but at the same time retards the development of the fœtus, and tends to impair its vitality and render

the foal an easy prey to any disease that may overtake it at the period of birth.

Working and Breeding.

The view may not be universal, but it is very generally held that nothing conduces so much to the production of strong, healthy offspring as a reasonable amount of work under judicious management of the mare. A certain element of risk, it is true, always attends the active employment of pregnant animals, and especially those engaged in farm work, but with common care these are far outweighed by the benefits conferred on the dam and produce. With well apportioned work and a liberal supply of good food, foals are not only dropped bigger and stronger, but they resist exposure to adverse influences, and thrive and grow much better than those from idle, ill-conditioned mares.

As to the stage of pregnancy when mares should cease to work, different people entertain different ideas, but the question is surely far more one of management than one of opinion. It is common enough for mares to work right up to the time of parturition, and especially among little men who depend for their livelihood on the labour of their mares. But in these cases self-interest lends its force to management and largely determines the success of the enterprise. As a general system, such a course would be fraught with the greatest danger, but there can be no doubt where common care is observed in the selection and appointment of work, together with good general management, pregnant mares are all the better for use up to within three or four weeks of the time of foaling; when work is discontinued, daily exercise should be substituted, or, if available, some brief, light employment. The late Mr. James Martin—a rare authority, by the way, on blood and breeding—once observed to the writer: "I have foaled down eighteen mares this season. All have worked nearly up to the time of foaling, and without a mishap to either mare or foal." Such a result is not likely to be of common attainment, but it is most assured under the influence of reasonable, well-regulated work, and generous but careful treatment. In-foal mares should, however, be guarded against severe exertion, such as drawing heavy loads in deep ground or on hilly roads, or backing, or trotting at fast pace; nor should they be made to undergo long fasts or suffer fatigue. As pregnancy advances, and the calls of the growing fœtus on the nutritive resources of the dam become more and more considerable, so should the amount of work demanded of her be diminished, and the food ration undergo suitable adjustment. To assert that the

observance of such details should be among the commonplaces of every stud is only to suggest a state of things that, to say the least of it, is far from universal, technical education notwithstanding.

In the stable pregnant mares should be provided with plenty of room to permit them to lie down and extend themselves over a good bed of soft litter. The floor of the stable should not slant too much in a backward direction. When separated only by bails their companions should be quiet and free from vice. Breeding mares, however, never perhaps do better than when turned into the crew yard at night with a dry shed for protection from the weather and plenty of dry litter, provided they are on good terms with each other. Our cold and changeable climate has often been urged against this exposure of working animals, but experience teaches that with an adequate food supply the open yard is far more conducive to health than the atmosphere of the average stable, which is usually made filthy by the studious exclusion of outside air, and the deliberate confinement of that which is within. Moreover, the denizens of the open yard know nothing of those extremes of temperature the sudden alternations of which are so fruitful of disease, and while being at all times fitter for their work, they are also much less susceptible to sickness than those who spend their nights in the stuffy filth-laden air of a stable deprived of all means of ventilation.

When the weather permits, this kind of management allows the mare's being turned to grass for a few hours each day during the later weeks of pregnancy, without the risk attaching to animals more closely stabled. A bite of spring grass before parturition prepares for the more complete change of food which is shortly to take place, and protects the foal from those often fatal attacks of diarrhœa which result when mares are suddenly transferred from hard corn to pasture—from the close stable to the open field.

Food and Water.

Whatever may be the surroundings of the brood mare, she should receive an ample supply of good wholesome food, which should be regularly given. Long fasts, especially when associated with excessive work and fatigue, are distinctly inimical to fœtal life, and are often accountable for premature birth and sporadic acts of abortion. As an ingredient of the winter food, working mares should receive a liberal supply of pulped roots, and an occasional ration of bran, but on no account should the former be given to excess, or when in a state of decay. The pregnant animal is specially liable to digestive trouble, and for this

reason every care is demanded in her regimen. In some parts of the country potatoes are given as a substitute for roots, and in small quantities nothing can be said against them; but without careful supervision they may become a source of dire mischief, seeing that in certain conditions of decay they are capable of developing a poison as deadly as arsenic. Coarse, indigestible fodder, mouldy and mowburnt hay, are not the least harmful of degraded aliment, and should be altogether withheld from the breeding mare.

It is hardly necessary to insist that the supply of water be wholesome, if not pure, and it is not less important that it be regularly given. Long spells of work without water lead to drinking to excess, which in itself is a common source of trouble, but still more hurtful when the water which is consumed is cold and hard, as commonly supplied from the chalk. The familiar practice of allowing mares to "drink their fill" at the trough when returning from work heated and tired is much to be deprecated; the more so as pregnancy advances. A small quantity with the "chill off," to be followed by a full allowance after a brief rest and a little food, is more consistent with good management and security.

Brood mares should never be allowed to drink from ponds or ditches when low in droughty weather. In this condition the water they consume is not only saturated with the products of decomposition, but also with large quantities of decomposing organic matter. Moreover, it is in this state, when the beds of ponds and ditches become worked up with the feet, that the ova and larvæ of the most deadly of equine parasites gain access to the body. The writer is repeatedly being called upon to investigate losses resulting from this cause, and too often has witnessed the wreck of most valuable studs. In seasons of drought ponds and streams in the condition indicated should be fenced off, and the water carted from a clean source, or lifted into tubs without disturbing the underlying mud. Moreover, it should not be forgotten that the periodical cleansing of water courses and receptacles would do much to secure our breeding mares and their progeny against this fruitful source of sickness. This does not apply only to ponds and ditches, but to troughs and tanks, which often abound in filth. In advising the cleansing of the former, it should be understood that the common practice of dressing pasture land with the matter removed is full of danger to brood mares and their offspring, and indeed to horse stock generally, since any parasites or their ova that may exist in it are rendered immediately accessible to them while grazing.

Effect of Railway Travelling on Brood Mares.

The prevailing desire on the part of many to mate their mares with the best sires has been much encouraged in recent years by the more favourable terms and facilities offered for their conveyance and return over our various lines of railway. On the whole this may be regarded as a distinct benefit, especially to those who necessarily desire to keep down expenses, but it cannot be considered altogether an unmixed good. Long journeys inflicted on nervous, fretful young mares not infrequently cause them to refuse service or to prematurely part with the fruits of conception. Moreover, nursing-mares of excitable temperament, when long absent from their foals, are liable to return with the udder charged with unwholesome milk. Unless, therefore, the spirit of economy be tempered with discretion, not only may money be thrown away, but the life of the foal imperilled or sacrificed. Consequently, when mares are required to travel long distances to service, the udder should be emptied previous to leaving, and again on returning, before the foal is allowed to suck. Neglect of these precautions is sometimes followed by a troublesome and even fatal diarrhœa in the offspring. On reaching home a feed of scalded bran with which is mixed half a teaspoonful of carbonate of soda will prove serviceable in guarding against this untoward result.

Management of the Mare after Foaling.

Where large numbers of mares have to "foal down," comprising old and young, healthy and strong, to say nothing of varied temperament, habits, and vices, management after foaling demands a considerable amount of care and watchfulness on the part of the responsible head.

Mares which have been at the stud for some time generally know how to discharge the duties of their office, and if all has gone well in foaling, there is little to trouble about. With young mares, however, fresh to the business, certain special precautions require to be observed. Fretful and irritable animals should be waited upon only by their common attendant until they have become reconciled to their new condition and the excitement resulting from parturition has passed away.

While the foal is "getting its legs," the permeability of the teats should be tested, as it sometimes occurs that one or both have no outlet for the milk, and the defect usually remains to be discovered when the foal has been reduced to the verge of starvation. At the same time attention will be given to the

state of the gland and the quantity and quality of the milk it promises to afford. This precaution is specially called for in the case of mares foaling before their time is up. In such cases there is often a scarcity of milk for a day or two, and the necessity of drawing it from another source will require to be considered. Surplus milk from another mare will be found useful here when it is procurable.

If the afterbirth has come away it should be promptly removed from the box, and buried sufficiently deep that dogs may not exhume it. In too many instances it finds its way into the crew yard, whence it is hurried off by dogs into the "home field," where possibly other in-foal mares are pastured, and provoked to excitement and, it may be, premature parturition.

In the matter of food, a little warm oatmeal gruel is perhaps the best restorative, to be followed by a small feed of well-scalded bran, a little malt-meal and two or three tablespoonfuls of linseed oil. Mares advanced in years and those in low condition are materially benefited by a pint of good beer or an ounce or two of whisky where foaling has been protracted and difficult. So soon as the foal can stand, the box should undergo a thorough cleansing. All the litter fouled by the discharges of the mare should be removed, and after the floor has been freely dressed with some disinfecting powder, a fresh supply of clean litter is to be given. The danger of decomposing organic matter in the foaling box is too little appreciated, and so long as it is permitted so long must the breeder count on the diseases incidental to filth and putrescence. The risk attaching to uterine discharges is not limited to that which falls to the ground, but equally serious consequences may result from that other portion which, by trickling down between the thighs, or first soiling the tail, ultimately finds its way on to the udder and teats, and finally into the stomach of the foal. This and other descriptions of putrid matter adhering to the teats are productive of the worst and most destructive forms of diarrhœa. Many of those mysterious attacks of this ailment attributed to all sorts of possible and impossible causes arise out of the ingestion of putrid filth taken in the act of sucking. Not only may this poisonous stuff find its way on to the udder by trickling down the perinæum, but it may also be transferred from the filth-laden tail, or be gathered from the sodden litter on which the mare may lie.

This leads us to suggest the desirability of safeguarding the foal by repeated sponging of the udder during the few days the uterine discharges continue, and further to thoroughly wash and cleanse the tail of the dam after parturition. These precautions,

always desirable, are rendered especially needful where difficulty has been experienced by the mare in foaling.

For several days, or it may be weeks, depending upon the season and state of the weather, the mare and foal will be kept in confinement. During this time the former should receive a liberal ration of crushed oats, bran and hay chaff, to which may be added a little malt-flour and salt.

For the first two days after foaling the mare should be carefully protected from exposure and draughts, but since she is soon to go to grass, over-heating of the stable requires to be strictly guarded against by free but duly regulated ventilation. Through neglect of this precaution both mare and foal are sometimes exposed to dangerous extremes of temperature, not rarely resulting in fatal pneumonia. To keep a foaling stable too cool is pardonable, to overheat it is culpable. At the earliest opportunity consistent with safety both should be turned to grass. Midday, when the sun is up, the ground fairly dry, and the air not too fresh, is the most suitable time for the initial turn-out. The first impulse of a foal when liberated from confinement is to gallop and gambol until overheated and fatigued, and many a fatal attack of pneumonia has followed the subsequent rest on wet ground and exposure to cold, biting winds. A paddock with shelter from the north and east is much to be desired. Early spring is a period when the weather is given to rapid and extreme changes. Sudden clouding, cold winds and driving rains quickly succeed to bright warm sunlight, necessitating a return to shelter and protection. In a few days, however, with suitable cover at night, foals will adapt themselves to a complete outdoor life. Where in the case of early foals a turn-out is not permissible for some time, both mare and foal should have daily exercise. If the weather does not admit of its being taken out of doors, then a barn, covered yard, or shed may be used. A little movement causes foals to "straighten up" much more quickly than they otherwise would do, and to put them fairly on their legs.

As to how far grass will require to be supplemented with manger food when the turn-out is made will depend upon a variety of circumstances, the more important of which are the weather and the quality and stage of growth of the pasture. When the one is cold and the other backward a liberal daily ration of dry food should be provided, and, in any case, young mares that enter on their breeding career at two and three years old—as is now too much the practice—should receive a generous allowance of dry food until grass comes to its best and the season is well advanced; and the same may be said for old

mares who enter on their maternal duties late in life, and whose yield of milk is often very limited in amount and not always of the best quality.

In all cases, but more especially in those referred to above, not only should the mares be liberally fed, but the foals should also be encouraged to share in the manger food of the dam, so that any deficiency of milk supply occurring as the season advances may be promptly compensated by an addition to the corn ration. Loss of flesh and stunted growth in the offspring of the young and immature, as also in those of old and worn-out mares, are common consequences of neglect of this simple precaution. It may here be noted that continuous stocking of pastures with horses from year to year is a practice that never fails to bring trouble to the breeder sooner or later, whatever may be said of it on the ground of expediency. Besides fouling the soil and exciting abortion it tends to the scattering and accumulation of parasitic life in favoured spots, and the ultimate development of verminous disease, especially in the young. The danger becomes considerably increased where the enclosures are small, and more so if in addition they are wet and retentive of moisture. Mares, and foals too, are benefited by a good range of open ground, and a periodical change of pasture. Over-stocking and confinement in small enclosures are much to be deprecated. By the one the herbage is rendered rank and foul, while the other deprives the mare and foal of those short spells of exercise which conduce so much to health, condition and action. Pastures grazed with bullocks alternate years, or thinly stocked with horses and bullocks at the same time, are the most suited to the requirements of the brood mare.

The Treatment of Foals.

Attention to the Foal after Birth.

As a rule, the umbilical cord or "navel string" is broken from the afterbirth in the act of foaling. Occasionally, however, the foal is born enclosed in its membranes, with which it continues to be connected. In the latter case no time is to be lost in removing the youngster from its enclosure lest by excluding air from it too long suffocation ensue. The next step will be to divide the cord and free the one from the other. Before doing this some light string soaked in carbolised oil should be procured, and the hands of the operator, as well as the knife he employs, should both be thoroughly washed and well carbolised. This having been done, a carbolised ligature is now tied tightly round

the cord about an inch from the belly to prevent escape of blood. The cord is then cut through with a knife below the string, after which the navel should be freely dressed with carbolised oil or some equally efficient antiseptic. After protracted labour, or when the foal has been unduly confined in its membranes, it is sometimes found either exhausted to the point of extinction or threatened with suffocation. In these conditions any mucus or watery matter contained in the nostrils should be promptly removed, the legs and body should be briskly rubbed with wisps of hay, and artificial respiration is to be resorted to where the breathing becomes feeble and disposed to arrest. Restoration of the respiratory function in these cases may sometimes be facilitated by applying to the nostrils a bottle containing smelling salts, or, failing this, the fumes of tobacco may be used in the same way. As breathing becomes re-established, warm flannel wraps will prove a useful restorative, and a teaspoonful of brandy given in a little of the mare's milk will assist in the same direction.

After the lapse of half an hour the foal when free from such mishaps is ready with a little help to get on its legs, and when the dam has licked it over it may be conducted to the teat. A little milk drawn from the mare and rubbed over the gland will attract the foal by its odour, and sometimes save a good deal of trouble in starting it on its "milky way." Ill-nourished, weakly foals may be some time ere they rise to the teat, in which case careful supervision becomes necessary to avoid accident, and a little milk drawn from the dam and fed to it by hand will assist in helping it to its feet. These sickly youngsters often present a very misshapen appearance, with their bent knees and hocks, arched back, and depending head, but if the dam is a generous milker and supplied with good living, they soon begin to "straighten up." When these conditions are not fulfilled growth becomes impaired, the body stunted, and the limbs more or less permanently deformed.

Foals Prematurely Born.

It sometimes occurs that the foal, for some reason or other, that may or may not be apparent, is born before its time. As to what should be done with such creatures will depend upon their lineage and prospective value, as also upon the stage of gestation when they quit the dam and the strength and vigour they exhibit at the time. If birth is four or five weeks premature there is little hope of any good being done with them, and others less forward are always a source of considerable trouble.

They are necessarily small, ill-developed and feeble, and require the greatest care and attention. For some time they are unable to stand, and cannot therefore feed themselves. They exhibit a constant desire for sleep, and, as a matter of management, everything should be done in this respect to satisfy the requirements of nature. The breathing is always more or less hurried in these immature youngsters, sometimes so much so as to give the idea of some grave lung disease, but under favourable conditions the respiratory function gradually approaches the normal standard.

Where it is decided to rear a foal of this kind it should be removed from the mare so soon as she has thoroughly cleansed it, and placed in a warm, dry apartment; if the latter is capable of being artificially heated so much the better. The body should then be covered with a couple of warm blankets and kept perfectly quiet, so that sleep may not be interrupted. So much milk as the mare affords is to be taken from her every half hour and given to the foal directly out of a clean vessel previously warmed. A feeding-bottle for this purpose may be easily extemporised with a quill, a little worsted, a perforated cork, and a pint bottle, or the milk may be sucked from the finger. Whichever system is adopted cleanliness is of the first importance as a means of guarding against diarrhœa, which, when once established in these fragile things, is very difficult to arrest. It must be understood that this periodical feeding will require to be carried on during the night until the foal acquires sufficient strength to return to the mare and help itself, but the intervals between meals may be gradually lengthened out a little after the first twenty-four hours.

If, as sometimes occurs, the mare does not "come to her milk" at once, cow's milk must be substituted under conditions prescribed below for "Hand-rearing Foals." An enema of milk-warm water with a little glycerin may be given to empty the posterior bowel if no fæces are discharged during the first four hours, and, if necessary, a second injection should be administered later on. At this period of the foal's existence purgatives should be as far as possible withheld, lest the sensitive bowels be unduly excited and fatal diarrhœa induced.

Hand-rearing Foals.

Notwithstanding the most scrupulous care in stud management, disease will now and again assert itself, and, either by hopelessly damaging the udder or destroying the mare, leave the produce dependent for its food supply on some extraneous source. As to whether hand-rearing is a desirable course to

pursue will very much depend on the age, character, and breeding of the offspring. The more youthful it is when deprived of its parent, the greater the amount of trouble it will give, whether its other properties be good, bad, or indifferent; and those who undertake the task of ministering to the wants of these unfortunate youngsters must be prepared for no inconsiderable sacrifice of time, to say nothing of comfort, as well as for inconvenience and expense.

To procure a foster-mother is always a difficult task, and sometimes a most costly one. It does, however, now and again occur that a mare will lose her foal, and a foal will lose its mother, about the same time in the same district, and in such cases it is a mutual, if unequal. advantage to the persons concerned to bring the survivors together. When this can be done all the trouble contemplated above is removed; although it must be admitted that the transference of a newly born foal to a strange mare is not unlikely to be attended with digestive disorder and diarrhœa at first, and especially if the former has not received the first laxative milk of its dam, and the latter should have foaled several days prior to entering upon her fostering duties.

Failing a substitute, the next best source of food supply is the cow. Here again some consideration must be given to selection of the most suitable subject whence to obtain the milk; for, if the task of hand rearing is to be undertaken, it must be entered upon and pursued in such a way as to safeguard success at all points.

Although, as will be seen from the figures given below, the same constituents are found in the milk of the cow as enter into that of the mare. the actual and relative proportions of these constituents differ to a considerable extent in the two cases. In order, therefore, to approximate the composition of the one to that of the other, and to render it more suitable to the requirements of the foal, water must be added to reduce the proportions of casein and fat; and at the same time the deficiency of sugar must be made up by the addition of a suitable quantity of the domestic article. At first the proportion of water to cow's milk should be one part of the former to two of the latter; but as time goes on one part to three will be found more to the purpose. The following figures are percentages:—

	Cow's Milk	Mare's Milk
Water	87·0	88·0
Fat	4·6	1·0
Casein	4·0	1·6
Sugar	3·8	8·9
Salts	0·6	0·5

Thus it will be seen that while the fat and casein of the cow's milk is largely in excess of that of the mare's, the sugar of the mare's milk far exceeds that of the cow's.

Next in importance to a judicious selection of milk is the desirability of its being transferred immediately from the cow to the foal while still warm. To maintain the natural temperature (100° F.) it should be drawn from the cow into a vessel previously warmed, and afterwards diluted with water raised to 100° F. Cold, stale milk at this tender age is sure to provoke diarrhœa, and not unlikely to bring about a fatal result. Cleanliness in the vessels used and the handling of the milk should be strictly observed; and, above all, its administration must be frequent, and regular both as regards quantity and time. At first half a pint should be given every half-hour, and gradually increased as time goes on, while the intervals between each meal may be extended accordingly; but it must be remembered that, to be successful, the indications of Nature must be closely observed and acted upon. Neglect in this matter can have but one result—viz., failure.

In commencing this system of rearing from birth attention should be directed to the state of the bowels at the outset. Should the foal not have received the first milk of its dam, constipation is more than likely to exist, and should be corrected by the administration of a small dose of castor oil and an enema of glycerin and water. Where the milk of a newly calved cow can be procured, its purgative properties may be sufficient in itself to unload the bowels, in which case further interference becomes unnecessary. Once having commenced with the milk of a particular animal, it is most desirable that no change be made, if possible to guard against it; and the milk of a young cow freshly calved is much to be preferred to that of a stale old one.

Weaning Foals.

To wean a foal is not a very difficult matter, but to effect its severance from the mare with the least possible amount of trouble and loss requires a little consideration and some care. Few allow their mares to wean their own foals, and all are not agreed as to how and when the separation should be effected. There can be no doubt that the longer a foal can have the benefit of its mother's milk the better it will thrive and grow—all other things of course being favourable—but it has to be remembered that stud mares are usually performing the double duty of breeding and suckling at one and the same time, building up a new organism within, and ministering to the wants of a more

perfected one without, and to this is not unfrequently added a certain amount of daily work. Within proper limits these services may be carried on simultaneously, with but little interference with the economy of the dam or the growth of the fœtus she carries, but as the latter attains to higher development, and its demands upon the nutritive resources of the former become greater, the drain upon the system entailed by suckling is not only detrimental to the mare but also to the young she bears. Protracted nursing therefore in the interest of the born can only be carried on at the expense of the unborn. For all practical purposes it may be said that *under proper management* foals are ready to leave the mare when about five months old. In some instances where—from constitutional weakness, or from debility resulting from disease—they are weak and backward in growth, it may be desirable to continue them with the dam for a few weeks longer, but whenever the necessity for such a course arises the food supply of the mare should be increased accordingly, and all demands upon her for work should cease. Moreover, mares which have continued to nurse their foals into the autumn must have special consideration in their winter management, and, in addition to good food and plenty of it, require to be protected from severe weather. Such animals should be wintered in a warm yard and not turned out until spring.

To the foal the loss of the easily assimilable mother's milk is of considerable moment, and the change so soon noticeable in its coat and condition after being withdrawn from the dam is a good index of the fact. To guard against loss of condition the foal should early be taught to feed from the manger, and should be supplied with an extra quantity of corn, bran, and chaff, for a fortnight or three weeks before the separation takes place. In this way its desire for milk will be less keenly felt and its loss of it more readily overcome when the separation takes place. As to whether this separation should be effected completely and at once, or by allowing the foal to return to the mare at increasing intervals during the lapse of a few days, is a question upon which there is no complete agreement; and although in the hands of some the former system appears to be attended with a fair amount of success, we consider the latter to be the more rational and the best calculated to safeguard the health of dam and offspring. Whether the one system or the other be adopted, the mare will benefit by being placed on a spare diet for a short time in order to check the secretion of milk and bring the gland to a passive state. Any difficulty in this respect must be met by drawing the udder now and again as may be required, and putting the mare to gentle work.

Some Common Ailments of Foals.

The first fortnight or three weeks after birth is the most critical period in the life of a foal. At this tender age, when least capable of offering resistance, he is specially liable to be overtaken with accident and disease. As regards disease, derangements of the digestive system are, perhaps, the more common ailments, but the mortality from respiratory disorders as the result of cold, and blood-poisoning as the result of exposure to filth, are very much in evidence, even in some of our best and most fashionable studs. That the prevalence of these affections can be largely curtailed by judicious management and foresight is best realised by a knowledge of the sickness rate and death rate in different establishments under different systems of management.

Constipation.

This affection is not unfrequently found to exist at the time of birth, for although no solid food has entered the mouth of the foal during utero-gestation, the intestines always contain more or less of a yellowish-brown or greenish-brown substance known as "meconium," and which the foal usually discharges soon after birth. This is the solid residue of the secretions formed by the intestines and the liver, and which has accumulated in the bowels during fœtal development. It is a common practice with some to anticipate constipation by administering a dose of castor oil to all foals soon after birth; but, in face of some disagreeable experiences of the custom, it is not, in the writer's opinion, a desirable course to recommend, for just as there are cases disposed to constipation at birth, so are there others in which the bowels are too seriously relaxed to endure the further irritation entailed by a dose of oil. Indeed, we have known several valuable foals lost by converting into an acute and fatal diarrhœa what was originally a simple relaxed state of the bowels. Constipation at birth is more especially noticed in early foals, when the dam has lived in confinement on hard food with little or no succulent aliment.

If the bowels are normally active the foal will empty himself in the course of the first two hours after birth. Where this does not take place, an enema of milk-warm water, with a little soap and glycerin dissolved in it, should be given, and repeated half-an-hour later. Any sign of restlessness, whisking the tail, straining without a motion, or looking towards the flank, should be promptly followed by a dose of castor oil, which will usually

afford speedy relief. Should the bowels not respond, no time should be lost in seeking professional advice.

Diarrhœa.

This is one of the most common of foal ailments; and, in addition to a heavy mortality, many promising youngsters who live through it are every year hopelessly dwarfed by its abiding effects on the digestive canal. Of the many and various causes that conduce to it some have reference to the mare herself, and others are of an extraneous character. In connection with the former we have already noticed the baneful effects of the uterine discharges when permitted to foul the udder. There can be no doubt, too, that under certain conditions the milk of the dam is liable to acquire properties which irritate and inflame the delicate membrane which lines the alimentary canal.

This is specially noticeable in sudden and complete changes from one description of diet to another, in the use of unwholesome food and filth-laden water, and not less so where excessive work is imposed upon the dam associated as it usually is with excitement and long absence from the foal. Moreover, the milk of mares "in use" frequently relaxes the bowels, and may provoke an acute attack of diarrhœa. An undue proportion of fat in the lacteal fluid has also been known to give rise to the same result. The fact should not be overlooked that a short supply of milk from the dam, or milk when yielded of an inferior character, may drive the foal to take manger food to excess before the puny stomach is capable of digesting it.

Many outbreaks of diarrhœa in foals may be traced to this cause, especially in the offspring of old mares who have been put to the stud late in life. Indigestion in the mare is not infrequently the precursor of this disease in the offspring. Foals confined in close stuffy boxes, deep in fermenting manure, are specially liable to diarrhœa under the influence of slight inducing causes.

To identify and remove the cause is in this, as in all other diseases, of the first importance. Food and water will naturally claim attention with the object of removing anything that may seem objectionable from the one or the other, or, if needs be, effecting a complete change in both.

In the early period of the attack, while the bowels are still free from inflammatory action, a dose of castor oil may be of service by causing the removal of any objectionable matter they may contain. A mixture of bicarbonate of potash, precipitated chalk, aromatic spirit of ammonia, and oil of peppermint, given

every three or four hours, is a useful corrective. When the foal gives evidence of pain, a little tincture of opium may be added to the prescription. A teaspoonful of bicarbonate of potash given to the mare night and morning, or oftener, and a feed or two of barley while the foal continues sick, are useful adjuncts to treatment. It should, however, be remembered that while it is most desirable to have such means of relief available for the moment, it is equally important that no time be lost in seeking professional help. Changes in these sickly youngsters are frequently rapid and severe, and all the skill and foresight of the expert is sometimes required to guard against fatal complications. If the foal refuses the teat, the mare should be milked out from time to time, so that when appetite returns the secretion may be fresh and wholesome.

Cold and Pneumonia.

Foals born in the early season, when weather changes are rapid and severe, are often the victims of cold, resulting in inflammation of the lungs. This is notably so when they are turned out of hot, badly ventilated stables into the open pasture, and, after taking the customary gallop, extend themselves while heated on the damp, cold ground. Pneumonia is usually preceded by catarrh, or common cold, when the foal is heard to cough, and appears dull and listless; the coat stares, a discharge issues from the nose, and although a desire for food still remains, the teat is taken without relish. In pneumonia these symptoms are supplemented by quick breathing, a high temperature of the body, cold extremities, congested membranes, and prostration.

Whenever symptoms of cold appear at this tender age, the foal should be promptly transferred to a warm box, free from draught, and well supplied with clean dry litter and pure air. If the bowels are constipated an enema of milk-warm water, in which a little soap and glycerin has been dissolved, may be administered, and repeated once or oftener, as the case may require. When the cough is troublesome, a weak mustard plaster should be applied to the throat and along the windpipe, or, if the breathing be embarrassed, to the sides of the chest. Foals do not readily tolerate clothing, but where no resistance is made a light rug may be thrown over the body, but in no case should the foal be excited or worried into submission. As to medical treatment this is a matter requiring special knowledge and discrimination, and should be left entirely to the veterinary expert. Good nursing may well take the place of empirical physicing, which at this tender age is fraught with the greatest danger.

Joint Ill (Pyæmic Arthritis).

This might be very fairly described as a disease that mostly kills and always maims, if it does not completely disable, its victim. Although commonly described as "joint ill," it is not to be regarded as a mere local affection. The disease of the joints so commonly identified with it is like the eruption in small-pox—a mere local expression of a general derangement of the system arising out of the introduction of infective matter into the blood stream—or, in simple terms, it is a form of blood-poisoning manifesting itself by a febrile state of the body and the development of abscesses in and about the joints, and also in one or several of the internal organs. It usually occurs between the age of one and four weeks. Sometimes it runs a rapid course and kills in a few days, or it may assume a less acute form and extend over several weeks. Whether it be the one or the other matters but little—the result is commonly death or irreparable damage.

Until a few years ago the origin of "joint ill" was altogether unknown. Since, however, the more intimate study of pathology, a rational explanation has been rendered possible, and it is now believed that the wound resulting from the tearing away of the umbilical cord or navel string from the body of the foal is the door by which organisms of a destructive character gain entrance to the broken blood-vessels, and thence find their way into the blood-stream and become distributed over the system. After settling down in the tissues of the joints—or it may be the liver, lungs, and other organs—they undergo rapid multiplication, resulting in the development of abscesses and destruction of the invaded parts.

The onset of the disease is marked by dulness, fever, and stiffness in one or more of the limbs. This is soon followed by a hot and painful swelling of the joints, intense lameness, and great suffering and prostration. Abscesses sooner or later form and break, and the affected joints are seriously damaged, or altogether disorganised. When the lungs are involved, the breathing becomes quick and embarrassed, and the disease runs a rapid and fatal course.

Treatment in this affection is rarely found to be of much avail, but the best results may be expected from measures of prevention when thoroughly carried out. To intercept and destroy the invading organisms until the "navel-wound" has completely healed is the real object to be accomplished. In this connection, therefore, it is of the first importance that those lessons of cleanliness which we have insisted upon elsewhere in

respect to the foaling box be strictly observed. Where, as is sometimes the case, the umbilical cord requires to be ligatured, it should first be freely dressed with antiseptic solution, and nothing in the shape of dirt in its widest sense should be allowed to come into contact with it. The string employed for tying it to prevent bleeding should have been previously steeped in carbolised oil, and not, as is usually the case, taken from any dirty source accessible at the time. Not only so, but the hands must be clean and well disinfected before the operation is undertaken.

Whether the cord requires to be tied or not, the "navel" wound should be dressed five or six times a day with carbolised oil until completely healed. It cannot be too forcibly insisted on that as this is a disease identified with filth, its prevention can only be assured where the rules of cleanliness are strictly carried out.

Umbilical Hernia.

This consists in an escape of some portion of the intestine through the umbilicus, or navel opening. It is usually spoken of as "rupture," but in a large majority of cases it is the result of imperfect closure of the navel orifice, in consequence of which the bowel is allowed to pass through the walls of the belly, and to rest in a pouch formed outwardly by the skin and inwardly by a protruded portion of the lining membrane of the abdomen. In some instances it is the consequence of rupture taking place before or after the opening has become firmly healed over.

In whichever way it may occur it is recognised as a soft, round, fluctuating swelling. Sometimes it is small and soon disappears altogether without interference. At others it becomes progressively larger as time goes on, and, in weakly foals especially, may reach a considerable size. There is no constitutional disturbance or suffering attendant upon this defect, unless, as now and again happens, the extruded bowel becomes strangulated.

Whenever hernia appears, and shows a disposition to enlarge, it should receive prompt attention. A pad of tow or cotton-wool attached to a roller should be applied to the swelling and secured in position by a crupper, collar band, and side tapes. While this is being done the little patient should be kept in the stable as quiet as possible. Should it fail to be effective, a repetition of blisters over the part may have the desired result, or it may be necessary to ligature or clamp the pouch of skin after returning the bowel into the abdominal cavity; but these latter methods will require to be carried out under professional

advice. Early treatment in this disorder is most essential, as it is while the opening in the belly is small that the greatest prospect of a speedy cure is offered.

SIRES AND THEIR WORK.

To render the services of a sire productive in the fullest measure requires, among other things, that the laws of life and health shall be strictly observed, and his sexual work adjusted and regulated to his peculiar capacity. Experience teaches that the reproductive powers of horses, as of other animals, differ, not only in different individuals, but at different periods in the life of the same animal; and it is of the first importance to the success of the breeding stud that something like a reasonable estimate of the average sexual capacity of a sire should be understood, so that abuse may be avoided, his services prolonged, and the number and value of his produce enhanced.

That a horse well-grown and healthy should enter on his stud career at two years old is pretty generally conceded, but the great disparity of opinion and practice existing among breeders and owners as to the number of mares he should receive clearly shows the necessity of some common understanding on the subject. The number of mares sometimes allowed to horses at this age is almost incredible, and the view seems to find favour with many that what a colt can do should be the measure of what he should do, and it is no rare occurrence for forty, fifty, and sixty mares to receive service from these baby sires during their first season. That they may be fairly fruitful under such a strain there are examples to show; but the general result of such a practice is not only to check growth and physical development, but to lay the foundation for sexual weakness and disappointment in the following season, and it may be to produce an abiding weakness of the reproductive function or even permanent incapacity to get stock. Moreover, the offspring of horses so over-taxed are at the best but doubtful blessings to the breeder, and many a farmer can tell how his money and the stud services of a good mare have been thrown away by the incautious use of these overworked youngsters.

Having regard to health interests, to quality of produce, and endurance at the stud, a horse at the age in question should not be allowed more than ten to fifteen mares, and it would be much to his advantage, as it would to that of all young sires, if the season were allowed to get well advanced before commencing service. At this time grass will be plentiful and good, mares will "come keen" to the horse, the chance of returning will be materially

diminished, and the horse's services correspondingly lightened. As to older stallions, the same discrepancy of practice obtains with them as with the more juvenile section, and many a good horse is prematurely used up or falls a victim to disease as the outcome of unbridled abuse. The number of mares a horse should receive from three years old upwards allows of no fixed rule being laid down. Very much will depend upon growth and development, and even more on natural vigour of constitution and sexual capacity, which latter can only be known by experience. Some horses almost complete their upward growth at two years, while others at that age have made but little progress.

This is a matter of the first importance, and should receive the fullest consideration in assessing the work of young sires. It should ever be borne in mind that at the time when growth is most active the reproductive function is least capable of being sustained in any undue demand that may be made upon it.

The difference in the capacity of horses for stud work is remarkable. We have known some in the heyday of their life and throughout their stud career to display the most feeble desire for service, although in no way failing in fruitfulness, while others have combined with an extraordinary capacity for service an equally remarkable productiveness and endurance. Many stallions, and some of great celebrity, have been known to serve from 200 to 260 mares in one season, and to leave a fair proportion of foals. Not less remarkable is the large number of mares that some horses will serve and "stop" in a short space of time. Thus it is said of a well-known Shire stallion that, on completing a heavy season in Lancashire, he was let to a syndicate of farmers in the South, and on reaching his destination at three o'clock in the day, there awaited him twenty-three mares, nineteen of which were in season. The whole of the latter received service between three and twelve o'clock at night, and thirteen proved to be in foal. Equally remarkable examples of sexual vigour and fertility might be instanced, but they only serve to emphasise the fact indicated above, with which most owners of stallions are more or less familiar. For reasons already given it is difficult to fix a numerical standard of stud-work applicable to all horses. But for the average sire some such formula as the following may be accepted as fairly consistent with the best interests of the horse, his produce, and the owner :—

Age	Number of mares
2 years old	10 to 15
3 " "	25 " 30
4 " "	45 " 60
5 " " and upwards . . .	70 " 100

With judicious management and reasonable limitation of stud services, in accordance with condition and constitution, a horse may continue to get valuable stock to a late period of life. Much confirmatory evidence of this truth might be adduced alike from Thoroughbreds, Hackneys, Shires, and others. Among the former (Thoroughbreds) I find that Birdcatcher was twenty-three years old when he got Oxford, the sire of that good horse Sterling, from whom sprang Isonomy. Touchstone was twenty when he got Lord of the Isles, the sire of Scottish Chief. King Tom was twenty when he got Princess, the dam of Royal Hampton. Harkaway was sixteen when he got King Tom, and the granddam of Princess fell to Bay Middleton when he was twenty-two. Vedette got Galopin when he was seventeen, Melbourne got Young Melbourne at twenty, Voltair got Voltigeur at the same age. Blair Athol fell to Stockwell at eleven, Newminster got Hermit when sixteen, and Touchstone got Newminster at the same age, and Rosa Bonheur at twenty-two. These are but a few of many horses of the highest repute which have been got late in life from Thoroughbred sires, and many horses of equal merit in their respective varieties—Hackneys, Shires, and others—might be found to have descended from sires not less advanced in years.

Condition in the Sire.

Whether a stallion be young or old, it is of the first importance that he be submitted to a thorough preparation for the season before him. Condition, if in a less degree, is as much a necessity of the sire as of the hunter or the race-horse, and without it it is hopeless to expect to realise the full benefit of his sexual powers. This conclusion would hardly seem warranted in view of the helpless state of obesity in which many of our horses start out on their season's work, but it is amply justified by everyday experience.

Want of condition not only renders reproduction uncertain, but lays the individual open to attack from all sorts of diseases and accidents of a crippling or even destructive nature, and to none more than that bane of stallions, laminitis. Eighty per cent. of the cases of this disease occur at the beginning of the season, when every organ in the body is overburdened with fat, and the muscles devoid of that healthy tone by which the feet are relieved from undue impact of superimposed weight.

Walking exercise, and plenty of it, during six weeks or two months prior to commencing stud work, with substantial fare, good stabling and careful management, are indispensible to

continuous good service. In regard to exercise, it must be said that men entrusted with this duty should be young and active, and have no excuse for loitering or wasting time on the road.

When a horse commences his season fat and wanting condition, his stud work is greatly multiplied, especially if at the outset he has a large influx of mares. In this state his early services are often abortive, and require to be repeated again and again, so that the vigour and condition with which he should have started is never attained. Young horses especially are made to suffer by neglect of this first principle of stud management.

On more than one occasion we have known valuable sires disposed of, on account of their inability to get foals, which have yet become sure foal getters in the hands of their new owners. A little physic, plenty of exercise, and good hard keep was the only assignable reason for the change from sterility to fertility. With judicious management horses "on the road" will uphold their condition as the season goes on, and far exceed in fruitfulness those that "stand" at home. How much the vitality and strength of the offspring depend upon the vigour of the sire at the time of copulation is an unknown quantity, but no one will fail to realise the importance of their physiological relations. It is distinctly to the advantage of stud horses that they be regularly fed, and that ample time be allowed for digestion to advance before going to service. Neglect of this precaution is accountable for many of those attacks of indigestion, twisted bowels and ruptured stomach, from which stallions so frequently suffer. Nor is it less important that, as far as practicable, horses on the road should do their work in the early morning and cool of the evening, so that the depressing effects of midday heat may be avoided.

Teasers.—Temperament in stallions is a very varying quality, not only as between one horse and another, but in the same horse at different periods of life. While some horses approach their mares with comparative coolness, others are thrown into a state of ungovernable excitement whenever they are brought in sight of them, and the ordeal of "trying" mares by horses of the latter description is sometimes carried on with the greatest difficulty, and not without danger to both horse and attendant. In these cases the animal is mad to get to his mare, and rears and plunges, and breaks out into profuse perspiration, not unfrequently with the result that the service is abortive. In such circumstances the preliminary "trying" should be done by an old horse, or "teaser," so that the one selected for service may come to his work fresh and fruitful, and be spared the

undue excitement to which he is otherwise exposed. Moreover, quite apart from temperament, the constant excitement of "teasing," where horses are called upon to serve large numbers of mares, is in itself prejudicial alike to health and sexual vigour. Valuable sires are best considered, and their services rendered most enduring and effective, when this office is relegated to another. Where horses are slow to come to their mares, a few minutes' walk in the service-yard before they are brought into contact will in some cases be desirable.

Drugging.—It is satisfactory to know that the old practice of drugging horses, so generally adopted twenty years ago, is fast dying out. This is no doubt due to that higher intelligence in regard to animal life and health which is now possessed by the average horseman, and the higher appreciation on the part of horse owners themselves of the serious consequences resulting from it. Old customs, however, die hard, and there are still some who believe that the sexual function may be quickened and upheld by the administration of drugs. It is only necessary to say that whatever effect they may have in provoking sexual desire, they are not likely to materially influence the propagation of the race, but by artificial stimulation to prove hurtful, and add to the functional debility that called them into use. Rest from stud work, generous living, and exercise constitute the only rational response to sexual fatigue.

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THE MARKETING OF POULTRY.

Although, as the title of this paper indicates, my object is to restrict myself to one branch of produce—namely, poultry—it is possible that some of the considerations here suggested may touch a wider field. It is indeed difficult to limit our inquiry, for the same influences are at work, to a large extent, on all kinds of agricultural production, and it cannot be forgotten that what is true of poultry is equally applicable to all the perishable food products of the United Kingdom—products similar to those which bulk so largely in our imports.

Speaking generally, one of the most common complaints which we hear in nearly every section of the country—that is, among producers—is that the returns they obtain are inadequate,

and that they are small compared with the retail selling price. Sometimes, when inquired into, the margin is less than would at first sight appear. Possibly it is largely owing to the contentment which prosperity has engendered in the English people that, in certain directions, we are being outstripped by the foreigner, and are paying vast sums of money for produce which might be grown at home. The future of agriculture in this country depends upon its economies as well as upon new developments, and one of the economies must be in the direction of those intermediary profits which reduce the returns received by the producer. As an instance of how we have been outpaced by the foreigner, it may be mentioned that the Irish Agricultural Organisation Society has been compelled to engage an expert from Denmark to teach the best methods of packing and marketing eggs, being unable to find anyone in this country who could undertake the work; for, with our neglect of those details which are necessary to perfection, and contentment with old but worn out methods, we have failed to progress as have our rivals abroad. It is better, however, to learn from these rivals than not to learn at all, and the first step towards a better state of things is to realise our own imperfections.

Lack of Organisation.

The lack of organisation in marketing means that producers must suffer. In other words, they do not receive the full value of their goods. This fact is recognised to such an extent that it is unnecessary to give examples. With the rapid, and, as a rule, cheap intercommunication between all parts of the country, the variations in price of the same products are very striking. Previous to the days of railways those districts outside the sphere of water communication were handicapped to an extent not now realised; but in these times Cumberland is practically nearer to London than was Cambridgeshire a hundred years ago. The price variations indicate deficiencies in our system which it is important for all who are interested in the development of our rural industries to carefully consider.

Weekly Markets.

At one time, in every town, large and small, throughout the kingdom, the weekly market was the most important means of bringing together producer and consumer, and the prosperity of the district largely depended upon the extent to which it was encouraged. Here came the farmers and their families, bringing

their products, which they offered for sale to anyone who wished to buy, and here the householders were accustomed to secure the week's supply of various kinds of food. For centuries this system had been practised. It might be somewhat crude, but yet had many advantages, and by it were obviated those difficulties which have arisen from our present methods, to which reference will be made later on. The producers and consumers were brought face to face, they knew each other, often buying and selling together for years. Moreover, the producers had a stimulus towards maintaining a high standard of quality which is often absent now. They were brought into competition, direct and immediate. with their neighbours, and if they failed to display produce equal to the average, this was speedily made patent to them.

We frequently are met with the fact that the standard of quality in many forms of food product is lower than it was a generation or two ago, though, as is usually the case, this is doubtless to some extent exaggerated, for we are always disposed to depreciate the present and exalt the past; but there is little doubt that the former marketing system was more directly stimulative in respect to quality than is that in vogue now. Of course markets are still held, and possibly in some cases are successful, but, in the main, they have greatly changed in their character, and in many places, at any rate, the principal buyers are traders, whilst in not a few higglers, or collectors, do most of the selling. I could name towns where the market halls or places are almost deserted, but where at one period long rows of farmers and their wives stood with butter, eggs, poultry, and other produce. Now they are empty, or their places are occupied by traders' stalls or shops. There are, of course, some exceptions to this state of things, but they are very few. That the change has been to the advantage of producers cannot be accepted for a moment. If they desire to secure a direct trade, they must go to the houses of consumers, but we can sympathise with their indisposition to do this.

Traders' Enterprise.

It must be recognised that the changes here referred to have been to a large extent unavoidable. The growth in size of towns and of industrial centres of population has necessitated the adoption of fresh methods of marketing. What was possible in an old-fashioned town, where the farthest limit was only a pleasant walk from the market place, is altogether out of consideration. We have only to realise what would be involved by

a householder going from her suburban residence to the central markets of any one of our towns, to understand that she naturally prefers to deal with the trader who sends his cart for orders every morning, and delivers the goods at the door, even though she has to pay a little more for them, and they are not quite so good as if purchased in the market from the producer. She has probably been brought up under the latter system, knows no other, and the enterprise of the shopkeeper, which we cannot but commend, saves her a large amount of time and trouble. And we cannot hope to alter this system—it has come to stay. No corporation could attempt to provide markets in every section of a town, and unless they are within a reasonable distance, residents would not patronise them, even were they disposed to do so, which is open to question.

The experience of the last few years in regard to retail markets in many places has not been of an encouraging nature, and such as have been started almost without exception have become but another opportunity for retail traders, they stepping in where the producers have not availed themselves of the opportunity. But another explanation can be adduced. It is a striking fact that markets of the former kind have retained more of their original character in districts where smaller farms still prevail. In such sections of the country as have seen an increase in the size of farms, there has naturally been an indisposition on the part of farmers and their families to market on old lines. For one thing, the quantity of some kinds of produce has greatly increased in the fewer individual hands, and what was possible in the lesser would be impossible in the greater. It would be unreasonable to expect the wife of a large and well-to-do farmer to stand in the market vending her fowls, and it is much better to recognise the fact, even though we lament the consequences. If she sells to a higgler, he must be paid for his time and trouble, and practically he becomes for the time being her servant. His recompense will largely, and rightly, come out of her pocket, as much as if he were directly in her employ. I have dealt in some detail with this aspect of the question, because it is a mistake to ignore accomplished facts—facts which cannot be altered. We shall be better able to meet the new conditions if we realise the forces which have led to them.

Collectors' "Rings."

It has already been shown that the middleman is a feature in our modern trading which cannot be ignored, and, further, that in the majority of our markets he is the principal buyer.

Our object must be to encourage him to the full, but at the same time to keep him in his proper place, which latter is, however, our greatest difficulty, for only too often is he the dominant factor. The greatest evil arising out of the present system results from the fact that there is a want of organisation which tends to play into his hands, by limiting the number of purchasers, and consequently a prevention of healthy competition. As an instance in proof of this statement, some time ago I came across a case which is very suggestive—namely, the formation of a ring among higglers, to the injury of producers and retailers alike. In one of the southern counties, which need not be specified, for the reason that like conditions are to be met with elsewhere, collectors traverse the districts, but have mutually agreed among themselves to cut down prices by practically killing all competition. Unless producers are willing to sell all their goods to the one collector to whom they are allocated, he refuses to take anything, and the price is thus absolutely fixed by him. Those who have attempted to escape from these fetters have been made to suffer in various ways. No other collector will buy from them, and they are thus compelled to accept the inevitable, for the majority cannot adopt any other method of marketing under present conditions.

But pressure is brought to bear not only upon the farmer. The retailer is equally handicapped—or, as one shopkeeper in a neighbouring town expressed it, he "dared not" buy direct from the grower. If he did, during the scarce seasons he would not obtain a fair share of what was going, and being unable to supply customers as well as his competitors could, his trade would be injured. It may be argued that rings of this kind are not confined to agriculture, but wherever found they are an evil which will yet have to be dealt with in a drastic manner, though it is not easy to suggest the best method of circumventing them. Probably co-operation will find a way, and both in Ireland and abroad this appears to promise the solution of what is a very serious problem. Hitherto isolation rather than united effort has characterised our rural population. From self-reliance has arisen much of the strength of the English nation; but it has been carried to an extreme, and we are now face to face with a new set of conditions.

Higglers and Higgling.

If we look to one section of England—namely, the south-eastern counties—it is to find that the system of collection works admirably. As is well known, the owners of fatting establish-

ments in Sussex and West Kent collect, or send out "higglers" to do so, from breeders of poultry, usually farmers and cottagers, living in the surrounding district. The birds are purchased and paid for on the spot. There is no expense to breeders in respect to carriage and marketing, and the prices, which are highly remunerative for good chickens, are thus subject to no deduction. During the spring months, when chickens are at their highest value, the price received for good specimens ranges from 2*s*. 6*d*. to 3*s*. 6*d*. each, and this for birds ten to twelve weeks old; but, of course, they must be well grown and likely to fatten readily. At such figures the breeding cannot fail to be remunerative. A farmer in West Kent some time ago informed me that in twelve months he had sold 87*l*. worth of chickens, the produce of fifty hens, which works out at a return of nearly thirty-five shillings per hen. Even when the cost of food and labour is deducted, this would leave a good margin of profit. But he could not have done this under present arrangements in many parts of the country. Living within the sphere of the fattening establishments, the demand for birds was greater than he could supply, and he was enabled to command the best prices.

In the report to the late Royal Commission on Agriculture, on the "Poultry and Fattening Industry in the Heathfield District of Sussex," written by Mr. R. Henry Rew, several instances are cited which prove the influence of these fattening establishments. Thus, the fatter, or higgler, "collects chickens periodically from the rearers. If he has a large business, he may collect every day in the week from different parts of the district, but more commonly he makes his journeys on one or more fixed days each week. The chickens are commonly taken at from three to four months old, the price varying according to the season of the year. The fact that the higglers, as one of them expressed it, 'run over one another,' and are rarely able to get as many chickens as they would like, tends to secure to the rearer the full market price of the day." In the same report are given various accounts supplied by rearers in Sussex, and we find that the average receipts over an entire year in one case work out at nearly 2*s*. 4*d*. per bird, which, taking the summer with the spring and autumn months, means that the spring chickens would be over 3*s*. each.

The question is often asked by those who live in other parts of the country, where nothing like these figures can be reached, Why are prices paid to breeders so well maintained in Sussex? The reply is obvious. Supply is not equal to demand. Competition is among the buyers rather than the sellers, and the latter can command full value for their birds. I have been told by

rearers that they sometimes had a call from as many as half a dozen higglers in one day, all of whom were eager to buy such specimens as were ready for fattening. These men know almost as well as the breeders when chickens are likely to be fit, and they endeavour to secure them. If one attempts to cut down prices, the next will be ready to pay them, and so long as this state of things continues poultry-breeding will be one of the most profitable industries in the south-east of England. Competition is a necessary factor in all such enterprises, and those who are sought after can, within certain limits, dictate their own terms. Carried too far, competition is an evil; but otherwise it is the most healthy condition of things. In some instances, as already described, it has been killed by the formation of rings, and where such is the case the evil will be and must be circumvented in other ways. I have heard fatters in Sussex and Belgium alike complain that they fail to make a legitimate profit on account of the high prices of lean birds; but it is a complaint which hardly seems to be warranted by the results.

Egg Collecting.

It may here be pointed out that the collecting system is necessary in connection with eggs, in order to ensure their being marketed in the best condition, and while they are fresh. Eggs can be kept in fairly good condition, either by preservation or in cool chambers, for some time, but they will never be equal to those which reach the consumer within three days of being laid. Buyers are beginning to understand that this is the case, and whilst they are willing to pay good, nay, high prices for really fresh eggs, even during the more plentiful months, they very wisely object to do so for eggs which have lost their pristine state of freshness. Hence the marketing system in vogue is unsuitable for this class of produce, and we thus find an explanation as to why many traders are compelled to depend chiefly upon foreign supplies, as well as of the fact that they are able to obtain a more constant and regular supply. Abroad the egg trade is well organised. The perishable character of the goods is recognised, and they are dealt with as their nature demands. In some parts of England, it is pleasing to record, the collection of eggs is being developed, and with very satisfactory results. But there is much more to be done in this direction. To take eggs into market weekly or fortnightly, as is the usual custom in many counties, is not enough, for they begin at a disadvantage, which is aggravated as time goes on. Formerly, when the sales made in our markets were direct to

consumers, this plan answered very well. But under present-day conditions, the buyers in the respective market towns being merely the first in what is frequently a somewhat long series of middlemen, it is evident that such a system means considerable delay, with depreciation of the produce. The same cannot be said, however, as to birds in either lean or half-fat condition, for they can be kept alive as long as it is thought to be necessary, and cannot be classed under the designation of perishable.

Irish Chickens.

Hitherto the deficiencies in production of chickens met with in the south-eastern counties of England have been to a large extent supplied from Ireland, whence vast quantities are brought over, especially of autumn-hatched birds during the earlier months of the year. In twelve months the London, Brighton and South Coast Railway Company has conveyed to Sussex no fewer than 300,000 fowls from Ireland. This was a few years ago, but I am inclined to think that the number has since then been reduced. Yet the trade is a very large one, the source of supply being chiefly from the midland and southern parts of Ireland. Many fatters will not have anything to do with these Irish fowls. They are undoubtedly inferior in quality to the home-grown birds, do not fatten so well, and from some districts are greatly infested with parasites, which leads to a great amount of feather picking, and in some cases of flesh picking. There has, in addition, been a stiffening of prices in the sister island. At the same time the railway companies have considerably reduced their charges, but the benefit accruing from this reduction has chiefly been in favour of breeders and dealers in Ireland, who naturally have secured as much of the saving as possible, though they could not have done so had it not been for an increased demand.

Within the last few years a number of fattening establishments have sprung up in different parts of England, but the chief difficulty which they have met with has been the obtaining of a supply of suitable birds to fill the cages. Of course, an industry like this cannot be built up in a day, or even a year, and patience is required for its development. Breeders, however, have not always responded as quickly as could have been wished to the need; but we are naturally a conservative people, disposed to wait for a lead ere we move ourselves, and it will be some time ere these fattening establishments are taken advantage of to the extent which is desirable. Hence there has been an increased demand upon Ireland, practically the only extraneous source of supply, with enhancement of prices as the result.

Developments in Ireland.

We are now met with the prospect of a further increase in price of Irish fowls, and a reduction of supply, so far as lean birds are concerned. It has often been a cause for wonderment why, instead of exporting lean fowls to Great Britain, the Irish people did not fatten them, as in Sussex, and ship them dead. There is a fair amount of trade done in this way. The highest grades of poultry commonly sold in the North of England and Scotland are Irish, but these do not compare at all favourably with the South of England specimens. The best Irish are from County Wexford, where fowls of good quality have been produced for a very long period of time. More than 120 years ago Arthur Young, in the reports of the great agriculturist's tours in Ireland, again and again speaks of there being "plenty of poultry," and in one place he mentions "crammed fowls with potatoes and oatmeal and milk, 2*s.* to 2*s.* 6*d.* each." The cramming at that time was probably by hand, but afterwards, when we have no record, the system evidently fell out of fashion. The Wexford fowls, however, though on the whole good, have lacked that finish and completeness which is necessary to secure the best returns, but in spite of neglect to adopt improved methods these birds have kept their position.

Happily, both for the country and its people, a change is now taking place, due in the first place to the efforts of the Irish Agricultural Organisation Society, under the leadership of the Right Hon. Horace Plunkett, M.P., which promises to accomplish equally great things in connection with poultry-keeping as have been so manifest in respect to dairying. Leaflets are being largely distributed, giving in a succinct form clear and helpful information as to breeds, time of year to produce, hatching, rearing, and marketing; lectures are delivered at such centres as seem desirable; and co-operative societies have already been formed, or are in process of formation, whose work will be to knit the members together for mutual advantage, to establish fatting centres, to improve the quality of the produce, to find the best markets for its sale, and generally to educate producers as to the best and most advanced methods of poultry-keeping. The effect of this movement will be to increase the demand for fowls in each district.

But another result must be that, so soon as the benefit arising from the sending to Great Britain of chickens fatted and dead is made evident to the breeders, there will be a great falling off in the supply of lean birds hitherto available to our English fatters, together with such an advance in the price

as to put them out of reach if any profit is to be made. This contingency—and it is by no means so remote as might at first be thought—is one which must be faced. Even in such English counties as do not yet include fatting among their industries, much might be done to prepare for this demand. We may rest assured that if farmers and cottagers at home do not take advantage of the opportunity afforded them, others will do so. Up to the present time imports of live fowls from foreign countries have been comparatively small—in fact, nothing to speak of—but how long they will continue to be so it is impossible to say. If our foreign rivals once discover that there is money in the business, there is no doubt they will endeavour to secure a share of it, and it depends upon home breeders whether the official Trade and Navigation Returns will or will not show within the next few years a development such as has marked the last decade in respect to Russian eggs and poultry. When, as I explain further on, fowls are brought from Italy to Belgium by hundreds of thousands every year, the anticipation is not at all problematical, as we may find out when too late. That it may not be so everyone who is interested in this question must hope; but hoping will not in itself hinder such development.

What Might be Done.

When we consider the intercommunications between different parts of this country, it is not a little surprising how great are the variations in prices of poultry. These are not, however, so pronounced as in the case of eggs, but yet great enough to prove that by a little effort supplies could be brought where they are needed, finding thus an excellent outlet at enhanced prices. That some attempts in the direction suggested have been made by traders cannot be questioned, but only, as a rule, in a sporadic and irregular fashion, insufficient to encourage breeders to increase their supplies, or fatters to depend thereon. There is practically no connection between the two. The buyers have no recognised means of knowing when sufficient birds are likely to be brought forward, and until this state of things be remedied, it is scarcely to be wondered at that they do not place any reliance upon what might be important sources of supply. Surely it is possible to make provision for meeting the case. If the trade were organised, there is no reason why hundreds of thousands of chickens should not be produced in the suitable counties, thus meeting the present needs of fatters, and providing for the probable falling off in Irish supplies, should that take place. Where towns or other centres of population are

within a short distance, we cannot expect much margin beyond local requirements, but it would be a great thing accomplished if these latter were met. In the more purely agricultural counties, however, there could easily be produced far beyond what can be consumed; but this is useless unless they can find a paying outlet for the birds reared.

Of course, in many places there would have to be an improvement in the class of fowl kept; yellow or dark-fleshed birds will always be second or third grade. Equally will it be necessary to alter the time of year when hatching takes place. Even in Sussex early chickens are scarce, but elsewhere they are almost non-existent. For every bird marketed in April, probably a hundred are hatched in that month; for every bird hatched in December, probably a hundred are eaten. These April and May hatched birds come on the market too late, at a time when prices have fallen almost to their lowest point—for then the majority of rearers are also sending forward—and when there is a glut of both home and foreign poultry. Salesmen tell us of the difficulty they meet with in effecting sales at that season, and yet fowls are crowded upon them far beyond the legitimate demand. A change in the direction indicated would not only mean an increase of supply during the dear months of the year, but reduction in the cheap months, when it does not pay to fatten, and possible enhancement of returns at that time.

Ducklings.

It may be mentioned that, as a rule, other varieties of poultry than fowls do not present quite the same difficulties, at least in respect to geese and turkeys, which can thus be dismissed without further reference. Ducklings, however, can usually be marketed near at hand, and for them at certain seasons the inquiry is much greater than the supply. To obtain the best London prices they must be ready for killing between February and June, but in other parts of the country the bulk of the sales are made at a later period of the year. This is simply a question of price. Consumers would be willing to buy them earlier, but are unwilling to pay the fancy rates at which they are sold. Ducklings pay well even at summer figures, and anyone who has good birds to dispose of can readily find a market for them. In this case there is no demand for lean birds as in that of chickens. They are usually and wisely fed off where they are raised, and we do not meet with the division of labour as in connection with the fattening of chickens.

French Markets.

When we inquire what is being done in other countries, it is to find that the importance of markets is fully recognised both in France and Belgium; and doubtless the same is true elsewhere. From time to time I have had the opportunity of attending markets in the two countries named. It is not necessary to describe these at any great length, but the poultry markets at Houdan and Mantes, in the Seine-et-Oise district, and at Louhans, in Saône-et-Loire, and Bourg, in Ain, are among the most important. What is true of one is equally so of the others. These markets are organised by the local authorities, but form part of a general and widespread system of meeting the needs of the community, and receive practical encouragement from the French Agricultural Department. I was much struck with the fact that the Director of Agriculture at Paris was fully acquainted with the times at which these markets were held, and from M. Tisserand, when that gentleman occupied the position just named, received valuable assistance and information as to where the best markets are held and when would be the most favourable time to visit them.

Taking Bourg (Ain) as an example, whilst I have not been able to obtain statistics as to the amount of trade done there, an estimate was made that about a million birds are annually sold in this market—Paris, the Riviera, and Switzerland taking the greater part. I have counted on one day upwards of two hundred men and women standing in a double row on the market place offering poultry for sale, and within a short time of the opening every bird was sold. Only the better qualities, however, are offered in this way, those of the more ordinary type being disposed of direct to the dealers. This market is held every Friday, but, of course, the numbers exhibited for sale vary in accordance with the season of the year. Immediately before Christmas, in accordance with a general scheme for the encouragement of agricultural produce adopted by the French Government, a show-sale takes place, at which prizes are offered for the finest specimens exhibited. No entry fees are charged, and the objects in view are at once to maintain a high standard of quality by stimulating emulation, and to advertise the produce. In fact, this feature is on the same lines as the show-sales of cattle held at Bingley Hall and elsewhere in this country, and there would appear to be no reason why the principle should not be applied to poultry as much as to larger stock. The market at Louhans (Saône-et-Loire) differs from that of Bourg in that the majority of the fowls displayed

are alive. At this town a considerable trade is done in agricultural products, and the markets are held twice a month, one of which, on the third Monday in every month, is especially strong in poultry. The live fowls are shown in wooden cages, similar to those used for collection in Sussex, but holding from six to a dozen. One day when I was present, a thousand of these lots were sold, representing nearly ten thousand birds. As a rule, they were in half-fatted condition, as the custom in this district is for the breeders to feed them up to that point, selling to dealers, who finish them off in about a week.

Markets in Belgium.

In Belgium excellent provision is made in the same direction. It may be explained that the districts where vast numbers of poultry are reared for table purposes are distinct from the fatting centres. The latter are chiefly in Flanders, to the north-west of Brussels, Merchtem, Opwyck, Lebbeke and Assche being the chief villages for the industry, though there are several others concerned in it. But comparatively few poultry are bred in that section of Belgium, the rearing taking place in the Campine country, under which designation is recognised the district around the city of Malines, in Flanders and Brabant. This division of labour is found beneficial to all concerned, for the land in the Campine country is not so intensely cultivated as elsewhere, and the fowls are given an amount of freedom, in itself a great help to growth, which would not be possible under other conditions. Formerly Malines was the market where breeders and fatters met, but this has been transferred to Londerzeel, a few miles off. Every week thousands of fowls are taken thither. On given days carts laden with crates containing fowls are seen on the roads leading to Londerzeel, mostly drawn by dogs, some with two, three, and even four of these useful animals, and the district is drawn upon as far as twenty miles away. The system is found better for the breeders than if they were called upon at their homes, for they thus secure the benefit of competition. Here come fatters from the Merchtem country, who buy and take back with them the lean birds. Complaint seems to be as rife among the fatters in Belgium as in Sussex, that they have to pay so much for fowls that the margin of profit is greatly reduced. But this is a good sign, and especially for the rearers. When the fowls have been fatted, provision is made for their sale by weekly markets, that at Merchtem being an example. Here it is shown that upwards of half a million birds are sold annually,

in addition to those which are disposed of by direct trade. The charge of one centime per bird is made to exhibitors, and the rent or toll received by the commune in 1896 was 3,200 francs, representing 320,000 birds, the lessee having to provide in addition for his expenses and profit. Dealers from Brussels, Ostend, and other Belgian towns, as well as from Germany, attend regularly, the trade with the last-named country attaining large proportions.

Italian Fowls in Belgium.

During the last fifteen years a somewhat remarkable trade has sprung up in Belgium—namely, the importation of Italian pullets, which are sold to farmers, who keep them for one season as layers, then fatten them off, and replace them by a fresh stock. These birds arrive from May to September, the largest consignments appearing in July. Last year I inspected a lot of the Italian chickens on a dealer's premises in Brussels. As a rule they were about ten weeks old, weighing something like two pounds each. They were packed in crates holding thirty, and measuring 4 feet by 2½ feet. Out of the number specified two were always cockerels, and whilst they were all of the regular Italian or Leghorn type, the colour of plumage was very varied. M. Jos. Geyr, whose place I visited, sometimes receives 2,000 in one day, but there are several importers, and it is estimated that from 500,000 to 600,000 are brought over every year. They are conveyed by the St. Gothard route, and the cost for carriage is 3*d.* per bird. In June 1897 the price in Brussels was 1*s.* 6*d.* each. This interesting trade is very successful, and the purchasers find that the fowls thrive admirably, are good layers, and finally sell for more than they originally cost.

M. Vander Snickt, of Brussels, informs me that a scheme is now being promoted for producing similar birds in Northern Russia, and there does not appear any hindrance to its success. It is equally capable of adoption in this country, and with home-grown fowls. If breeders on the poorer lands, especially in the hilly districts, would lay themselves out to produce chickens of a suitable kind, hatching so that they would be ready to market in the early summer months, they could be sold by hundreds of thousands, and without interfering with anything else. There are many sections of Great Britain and Ireland eminently suited to the business. But to meet the case some system of bringing sellers and buyers into contact would be required, and here we see the importance of establishing markets for the purpose, without which we should

find the same conditions as have been already described in connection with the older specimens.

Local Markets Needed.

We have now to consider whether the methods which prove so successful abroad are applicable to the conditions of our own country. I submit that they are. The encouragement and development of local markets would do much to solve some of the difficulties which changes in our modern methods have created; would prevent the control now exercised by dealers, to the injury of both producers and consumers; and would enable merchants to meet with greater facility foreign competition, by focussing supplies, reducing expenses, and stimulating improvement, not only in poultry, but in many other kinds of produce. A writer in one of the weekly papers some time ago very wisely said: "There is no English town in which there has not, at some time, been a market, if it is not carried on at the present time. Now, it is in the power of thousands of our readers to bring some influence to bear upon the authorities to encourage the re-institution of sale in the market place where it does not exist, and its promotion where it does. We are acquainted with small producers whose prosperity is practically the result of a regular appearance in the market place. Modern trading has no doubt squeezed the little producer out. We find the auctioneer supplanting the farmer, the little trader's stall still supplanting the little producer's basket; and what is the result? The produce sold by the trader is constantly composed of material from abroad, often cheap and inferior, foreign meat, foreign fruit, and foreign poultry, and the little Englishman is elbowed out of a livelihood, whilst the consumers in our towns are almost forced into purchasing what they really do not want. Again we say this is done better in France. The market place is as valuable a help to the amateur as to the feeder for table."

Districts for Table Poultry.

It is necessary, however, remembering the class of food we have under consideration—namely, poultry—to indicate what districts are specially suitable to the rearing of table poultry. There is a very general opinion held in the North of England, Wales, and Scotland, that poultry can be reared better in the South than in the sections named. But this is certainly not true. Speaking generally, the whole of our southern counties are well situated for this industry, but even there places may be

met with which are unfavourable. It is not so much a question of climate as of soil, and many districts north of the Trent would grow chickens better than some others which might be named in the South. For good quality of flesh, for early maturity, clay or heavy lands are unsuitable. At the same time it may not be known that Sussex and West Kent are largely composed of the Weald Clay, but that differs greatly from what is spoken of usually as heavy clay. Wherever chalk, gravel, and light loam are found there is no physical difficulty in the way. Without going into unnecessary detail, for the fact here stated is a sufficient guide, we have only to mention that one of the most favourable districts for poultry culture is on the shores of the Solway. But where heavy lands prevail it will be found wiser to make egg production, rather than table poultry, the main object.

Local Authorities.

How, then, is the suggestion here made to be resolved into a concrete form? During the past seven years a great amount of money has been spent by various County Councils in the teaching of poultry culture, under their respective schemes for Technical Education. It may be thought that the committees responsible for the work should complete it by developing markets, but this they cannot do, as the Technical Education Acts prohibit money being expended in this manner. Unless this restriction can be removed—and, for one, I should welcome the removal—we must seek other means of attainment. That the County Councils could employ their ordinary funds for the encouragement of markets seems to be probable, and there ought to be no difficulty in this direction when the need for doing so is recognised. Nothing would be more calculated to advance the well-being of the agricultural community, and, properly organised, wisely planned, the cost would be small as compared with the benefit likely to result. Such a step should be taken in association with the local authorities, either town municipalities or district councils. Failing this, the latter might take the initiative. The success of Carlisle market is warrant enough for others to follow. What has been and is being done there is an excellent example.

At Blandford, in Dorset, and at Chard, in Somerset, a commencement has already been made. But to ensure success the markets must be made known, buyers attracted. These markets should be held at regular periods, announced long in advance, and not too frequently at first. I hope that some County Council will be enterprising enough to lead the way, but, before

doing so, a careful and exhaustive inquiry should be made, in order to fix the markets where, by reason of suitable conditions and easy communications, the probabilities of success are present. It would be easy to suggest a hundred centres in England where such an experiment might take place, but the immediate purpose is to rouse attention to the importance of the question generally. Details can be settled when the disposition to act is manifest. But we may be permitted to suggest that a primary consideration is that the markets shall be within reach of those for whom they are intended to form an outlet in the way of produce, and in many of the smaller towns, now left isolated by the competition of greater rivals, there is plenty of space available, and the initial expense would be very small indeed.

Conclusion.

In conclusion, it is only necessary to remind ourselves that changed conditions require new methods; that the teaching of experience is to prove, in many directions, how systems which have been highly beneficial during the period of growth become positive dangers when development has ceased; and that it is essential that we should from time to time move on to fresh lines, adapting ourselves to meet the forces around us, of which, probably, we were unconscious before. Frequently it simply means that we should return to older habits and customs, discarded, not because they were old, but that they had served their immediate purpose, and reintroduced when it seemed that the cycle of years had brought back once more a state of things similar to those which existed before. To the writer it seems that this is so in the case of our marketing system.

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FLOWER AND FRUIT FARMING IN ENGLAND.

I.

Introduction.

Flowers are treated first in this article for two reasons: first, because it was the remarkable development of the open-air flower industry and the great increase in the production of flowers as well as fruit under glass which suggested the inquiry upon which the report is based; and, secondly, because the

season for seeing most varieties of flowers at their best precedes the period of the year when fruit fields and plantations can be viewed to the greatest advantage.

With respect to the scope of the inquiry, it is desirable to explain that it was limited to the production of flowers, bulbs, and fruit for market, and did not extend to the growth of flower seeds or the rearing of fruit trees or bushes, which by themselves offer a wide field for separate investigation. It would be difficult to exaggerate the importance of the services rendered to producers and consumers of flowers and fruit by the great seedmen and nurserymen who, by raising new and choice varieties, have done much to increase the demand for these products of the soil, and to render their cultivation more profitable. It is no paradox to assert that, in relation to flowers and certain kinds of fruit, the supply has created the demand; for, by placing before the public large quantities of irresistibly beautiful flowers and choice fruit at low prices, what was until a comparatively recent period a mere longing, hardly entertained by any but the wealthy, has been developed into a desire which can be gratified more or less by the masses of the population. Moreover, the desire for charming flowers and delicious fruit grows by what it feeds on, so that the popular demand, once created, constantly increases. It is even possible to assert, without exaggeration, that the supply of certain products has taught the public to acquire a taste which they did not formerly possess. Thirty years ago very few people wanted daffodils or liked tomatoes; but the production of many beautiful varieties of the once neglected flowers, and the display of a fruit tempting to the eye and palate, have brought both into the front rank of products for the market.

As flowers and fruit are produced more or less extensively around nearly every town in England, besides being cultivated on a large scale in special country districts, it was no easy task to select typical fields of enterprise for visits of inspection. The selection of a few out of many was imperative, or the inquiry would have occupied a year or two, and involved a heavy outlay, with no other result than a needless repetition of experience. All that could be done was to obtain the best available advice as to the districts and individuals to be visited, and to act upon it, supplementing the information thus directly obtained by correspondence with good authorities in districts not visited. If certain districts well worth inspection have been left unseen, it was because they were considered to have been sufficiently represented by other examples; and a similar remark would be applicable to individual producers. With respect to the

individuals, moreover, it may have happened that in some cases the most important producers in a district were not those selected for visits; for, in the first place, the choice depended partly upon the accident of particular growers being known to myself or my advisers, and partly upon the consideration that a small producer in one district was the grower of a particular class of flowers or fruit that had not been seen in another district, while a more extensive neighbouring cultivator was mainly concerned with products that had been sufficiently noticed elsewhere.

In concluding these introductory and explanatory remarks, I must acknowledge my great indebtedness for introductions, information, and advice to Mr. Martin John Sutton, of Reading; Mr. Assbee, Superintendent of Covent Garden Market; Mr. George Monro and Mr. John Bath, of Covent Garden; Mr. John Wright, Editor of the *Journal of Horticulture*; and the numerous gentlemen named in the body of this report, to many of whom I gave a great deal of trouble by my visits or inquiries.

The Great Increase in Flower Production.

Unfortunately there are no precise statistics as to the area of land devoted to flowers for market in this country, as it is not included in the details of the Agricultural Returns. Even if an attempt were made to obtain returns of that area, the number of persons who grow small quantities of flowers for market is so great that the result of the inquiry could hardly be any better than an approximation to the actual acreage. As it is, there are no means of forming even a rough estimate of the increase in the cultivation of flowers during the last twenty or thirty years. There are not even any market returns to help towards an approximate statement of the increase in supplies. At least with respect to Covent Garden, Mr. Assbee, the Superintendent, informs me that only those who pay toll make any return of quantities, the numerous standholders and salesmen, who dispose of the bulk of the supplies, not being required to make any statement as to what they sell; and it is the same, I believe, with all other markets. The case is similar in relation to the supplies of foreign flowers, which are not separately enumerated by the Customs authorities even in value, though they might be easily enough. Therefore, no quantitative estimate as to the increase in the supplies of either English or foreign flowers can be given. That the increase in both has been enormous, however, is the testimony of all competent

observers. It has been in progress for at least thirty years, and has been especially remarkable during the last ten years. Going back more than thirty years, Mr. Assbee, in an interesting paper on "The Progress of Market Garden Cultivation during Queen Victoria's Reign," read before the Royal Horticultural Society last autumn, says:—"The crowning point of modern gardening is most certainly shown in the rise and progress of flower culture for market. There can be no comparison between 1837 and 1897 in this branch of market work. The few loads of potted plants and bunches of flowers only obtainable at Covent Garden centre row have been changed into the unique and magnificent spectacle presented by the early Covent Garden Flower Market of to-day. Nothing so much marks the advance of our working and middle classes in material progress, in improved taste and refinement, as their increased outlay upon flowers." Pointing to a glasshouse of moderate dimensions, which he had erected as a kind of show-room for his wholesale customers to visit, a grower of flowers within a few miles of London who has not reached middle age declared that he could remember the time when the whole of the Covent Garden supply could have been contained in it; whereas now an immense covered market is filled to overflowing with flowers and foliage plants, although the Scilly and Channel Islands consignments have been turned into the Foreign Market, because there was no room for them in the other, and the Foreign Market was extended 50 per cent. in area last year, to allow space for the demands made upon its capacity.

With respect to the supply of cut flowers, in which the advance has, perhaps, been most remarkable, Mr. Assbee does not hesitate to say that it has increased five-fold during the last ten years. From other markets I have received similar information, and it has been fully supported by what I have seen and heard in the course of my journeys in different parts of the country. Not only have new flower farms, and especially bulb farms, been established in various parts of the country, but, more remarkable still, flowers have encroached upon vegetables and even upon fruit in the old market gardens. This is particularly the case around London, culinary vegetables having been driven further afield to make room for fruit first and flowers afterwards, while bush fruits, formerly grown between and under standard fruit trees, have given place to flowers to a considerable extent.

The floral division of my subject is so multifarious that it is extremely difficult to deal with in a report of ordinary length, or, indeed, in a report of any extent. For example, the supplies of early foreign, forced English, and outdoor English flowers,

including those of the Scilly and the Channel Islands, so overrun each other that a schedule of varieties in supply in each month of the year would be a series of lists embodying a tiresome amount of repetition. Not a few flowers are on sale all the year round, and a multitude during a great portion of the year. For example, there are growers of roses under glass who cut flowers for market every week-day in the year, and lilies of the valley, now grown in seasons not natural to them from crowns retarded in refrigerated chambers, can also be obtained all the year round.

If we take the appearance of spring flowers in the market, such as snowdrops, violets, narcissi, Roman hyacinths, Dutch hyacinths, and lilies of the valley as marking the beginning of a new flower season, we have, as Mr. Assbee remarks, certain varieties forced extensively in the vineries and tomato and cucumber hot-houses of England and the Channel Islands coming into market contemporaneously with naturally-grown flowers from the South of France and Italy, in December, and followed closely by the open-air narcissi, anemones, and marguerites of the Scilly Isles, and later by similar products from the mainland of England. Very few forced flowers are imported, excepting French lilac, which arrives early in the year, and, apart from naturally-grown foreign and forced English flowers, the narcissi, including the daffodils, or so-called pseudo-narcissi, make by far the greatest display during the winter portion of the new year. As soon as the English open-air flowers become plentiful, the foreign supply almost ceases, until it starts again with chrysanthemums; and all the very numerous varieties of our native flowers follow in their seasons, until the outdoor Michaelmas daisy and the hot-house chrysanthemum complete the series. Even wild flowers, such as primroses, violets, and a kind of marguerite, occasionally make a fair display in the markets. The quantity of chrysanthemums produced in the autumn and early winter is simply enormous, as nearly all nurserymen have recourse to them as occupiers of their hot-houses after grapes, tomatoes, cucumbers, and other products, and as a means of finding work for their men. Last season the production was so overwhelming that prices were hardly, if at all, remunerative.

Some of the principal sources of various descriptions of flowers will be named in the accounts of visits to different districts and those received from provincial market centres. The common kinds of cut garden flowers, including hardy annuals and perennials, as well as plants for bedding and for keeping in pots, are commonly produced in market gardens and nurseries around the centres of population. This is particularly remark-

able with respect to the London supplies, which are mainly derived from districts within fifteen miles of Charing Cross, and although there are considerable contributions from more distant parts of the country, the comparatively near districts send great quantities to other markets than those of the Metropolis.

Nothing in the modern development of flower-growing in England is quite as remarkable as the advance of the narcissus industry, including the production of bulbs as well as flowers for market. Although celebrated in Greek and Roman verse, as Mr. Peter Barr states in "Ye Narcissus or Daffodyl Flowre and hys Roots," and referred to by Shakespeare at a later date as a common English flower, as well as described in 1629 by John Parkinson in his "Paradisus Terrestris," in which nearly a hundred varieties are mentioned, comparatively little attention had been given to the cultivation of the flower in this country until a little over thirty years ago, and it was some years later before bulb-growing and selling the cut flowers in the market became at all common in England. At the present time, according to Mr. William Barr, about six hundred varieties are known, and at least one hundred and twenty are well worth cultivating.

In a lecture delivered before the Royal Horticultural Society in 1884 by Mr. F. W. Burbridge, Curator of the Trinity College Botanic Gardens, Dublin, and reprinted in Mr. Barr's pamphlet, a short history of the narcissus was given. From this it appears that the late Dean Herbert was one of the first, if not the first, of Englishmen to raise hybrid narcissi some time before 1843, when several of them were entered in the *Botanical Register*. The beautiful Emperor and Empress daffodils, Stella, and others of the Incomparabilis division of narcissi, were raised by the late Mr. Backhouse, of St. John's, Walsingham, before 1865; while the late Mr. Leeds, of Longford Bridge, Manchester, also raised several new varieties at about the same period; and Mr. Horsfield, a Lancashire weaver, produced the now famous Horsfieldi. Early in the seventies Mr. Barr, of Long Ditton, acquired some of the new seedlings, and, on the death of Mr. Leeds, he obtained all that gentleman's collection, and began to grow narcissi on a steadily increasing scale, raising several new varieties himself, and procuring others from wild stocks in Portugal and Spain. Previously there were only a few varieties in the market, and some of those were imported from Holland. It is the common testimony of bulb farmers that Mr. Barr has done more than any other man to popularise the narcissus, and it is only right to pay this tribute to him as a grower and a hybridiser.

At about the same time as Mr. Barr became a grower of the narcissus, or a little earlier, the Scilly Islanders commenced to cultivate the few varieties found growing wild in their islands, as will be related hereafter. But, according to Mr. White, of Spalding, now an extensive grower, the pheasant eye and double white narcissi were grown for market on a small scale forty years ago by a Mr. Stevenson, in the Spalding district. There appears to have been hardly any demand for the flowers or the bulbs, however, as Mr. White adds that the industry did not pay even thirty years ago; also that it was not until new varieties began to attract attention that it became worth while to grow at all extensively for market. Except for snowdrops and a few crocuses, then, which—or at any rate snowdrops—were grown formerly in Lincolnshire much more extensively than they are now, the bulb farming of that county may be said to have been almost entirely developed within the last twenty years. At the present time it has become, perhaps, the most important single division of the open-air flower industry, not only in Lincolnshire and the Scilly Isles, but also in other parts of the country, including some districts near London.

Flower Growing in the Scilly Isles.

As the Scilly Isles are the main source of the flower supplies in our markets at the beginning of the year, they may appropriately be noticed first among the flower-producing districts of the country. The changes that have taken place in their cultivation from time to time are to some extent indicated in articles which have previously appeared in the Journal. Twenty-eight years ago Mr. Lawrence Scott and Mr. Harry Rivington contributed an interesting paper to the second series, vol. vi., part ii., on *The Agriculture of the Scilly Isles*; while, in 1890, Mrs. Brewer wrote for the third series, vol i., part i., on *Market-gardening in the Scilly Islands*. In the article of 1870 the situation of the Isles is given as in latitude[1] 49° 40′ N., longitude 6° 20′ W., due west of the Lizard, and twenty-seven miles W.S.W. of Land's End. No one appears to know the precise number of the isles and islets, as it is difficult to draw the line between a large rock rising out of the sea and an islet. The areas of the six principal islands with the population in 1851 and 1861 were given by Messrs. Scott and Rivington, and Mrs. Brewer gave similar details in 1890, though it is not stated whether the population was that of the census of 1881 or the estimated population of 1890. As

[1] Dr. Macklin, of St. Mary's, Scilly, in a pamphlet noticed further on, says latitude 49° 55′; longitude, 6° 19′ W.

there are wide differences between the areas given in 1870 and 1890, and there is no doubt that the earlier survey covered bare rocks and other useless land, I give only the figures from the latest survey in relation to acreage, with the population for 1851, 1861, and 1891:—

Islands	Acres	Population		
		1851	1861	1891
St. Mary's	1,520	1,668	1,532	1,160
Tresco	696	416	390	315
St. Martin's	515	211	185	174
St. Agnes	312	204	200	130
Bryher	268	118	115	91
Sampson	82	10	—	—
Totals	3,393	2,627	2,422	1,870

The object of comparing the population of the two earlier periods with that of 1891 (which was about the same as it is at the present time) will be shown presently. Sampson has not been inhabited since 1853, and it has since been used only as rough grazing land, as also are Tean (34 acres) and St. Helen's (40 acres). These are all the islands which are used for agriculture or horticulture, and there is a good deal of waste land in them. The soil is nearly all of granitic origin, and, for the most part, the cultivated top soil is a sandy loam, mixed with clay in some places, and with peat in others, but nowhere heavy. There are large tracts of almost pure sand; but nearly all that is cultivated is admirably suited to the growth of bulbous flowers and market-garden vegetables.

Encircled as the islands are by the Gulf Stream, their climate is remarkably mild and equable, protection to tender crops even in winter being needed only against the frequent gales of wind to which they are subject. Frost rarely occurs, while snow seldom falls, and hardly ever lies on the ground more than twenty-four hours when it comes. The rainfall is moderate. Seeing that the prosperity of the islands is mainly dependent upon climate, as will be shown hereafter, a tabular extract from *The Climate of the Isles of Scilly*, by Dr. Macklin, of St. Mary's, Scilly, will not be out of place. The averages of rainfall for the several months are those of twenty-five years, and the averages of temperature cover twenty years; all being based upon Dr. Macklin's observations.

The islanders would be glad of more rain than they get in the spring and summer. The mean daily range of temperature in twenty years is given by Dr. Macklin at 6·8°. October has

the lowest range, or 5·9°; April the highest, or 8°. The mean maximum range was 11·5°, November being lowest with 2°, and April highest, with 15°. The mean range for the whole year during the twenty years was 15·1°—*i.e.*, the difference between the mean temperatures of the warmest and the coldest month. Taking the six winter months alone, the mean range was only 3·7°. For the six summer months the mean temperature was 57°, and for the six winter months 47°, showing a difference of only 10°. These figures indicate not only a mild, but also a remarkably equable, climate. Dr. Macklin further states that the mean temperature of the Scilly Isles is one degree warmer than that of either the West of Cornwall or the Channel Islands.

RAINFALL AND TEMPERATURE IN THE SCILLY ISLES.
(St. Mary's Station.)

Months	Mean Rainfall	Temperature		
		Max.	Min.	Mean
	Inches	degs.	degs.	degs.
January	3 73	48·8	42·9	45·9
February	2·71	48·9	42 8	45·9
March	2 40	49·5	42 5	46 0
April	2 27	52·1	44 7	48·4
May	1 73	56·3	48·2	52·3
June	1·84	61 3	53 0	57·2
July	2 46	64·4	56·2	60·3
August	2 39	64·9	57·0	61·0
September	3·41	61·8	54·7	58·3
October	3·70	56·6	50·2	53·4
November	3·72	52·4	46·7	49·6
December	4·02	49 5	43·4	46·5
Annual	34 38	55·5	48·5	52·1

With respect to sunshine, recorded only during the last ten years, some comparative figures are given for the ten months ended with December 1, 1894, during which 1,551·1 hours' bright sunshine were registered in Scilly, or 155 per month, or 5 per day. The total was exceeded only by Jersey, Guernsey, Newquay, and Falmouth among places in the United Kingdom for which statistics were given. Hastings, Westbourne, Eastbourne, and Torquay, places high on the list, stood lower than Scilly. Ocular demonstration of the mildness of the Scilly climate is to be found in the tropical vegetation which flourishes in the islands, with respect to which a few details will be given in connection with Tresco and other places.

In briefly sketching the changes made in the cultivation of the Scilly Isles, the considerable decrease in the population will

be explained. When the late Mr. Augustus Smith, in 1834, became, mainly from humanitarian motives, Lord Proprietor of the islands (a title given to the lessees holding under the Duchy of Cornwall), they were over-populated, and the people, who partly lived by smuggling, were in a distressed condition. The sub-division of holdings had been carried on to a disastrous extent, and very many of them consisted of scattered plots of land. Mr. Augustus Smith set himself to the reform of the abuses which he found prevalent. He stopped smuggling, made education compulsory, enlarged and consolidated the small holdings, and allowed only one child in a family to succeed to his father's farm, practically forcing the rest of the youths to migrate to the mainland, to emigrate to the Colonies, or to go to sea. Never was a benevolent despotism better justified by results, though it was some years before the islanders became generally prosperous. Steadily, however, Mr. Smith, who spent all the rental of the islands for many years in improvements, educated the people in habits of industry and ultimately of enterprise, until, from being among the poorest small farmers in the United Kingdom, they became the most generally prosperous.

The extent to which the sub-division of holdings had been carried before Mr. Augustus Smith's time may be imagined when it is mentioned that, long after the consolidation had been in progress—namely, in 1870—the sizes of farms in St. Mary's were reported by Messrs. Scott and Rivington to range from five to fifteen acres, with the exception of one of thirty acres, which included a large proportion of untilled land. On the other islands, the same writers stated, the farms were still smaller, many covering only three acres, while the largest farm on St. Agnes was twelve acres in extent. At the present time the smallest farm in St. Mary's is ten acres, and the largest is eighty acres, exclusive of some rough grazing land; while the extreme areas are about five to twenty acres in St. Martin's, five to twelve acres in Bryher, and four to fifteen acres in St. Agnes, not counting the downs, which the tenants on these last three islands have in common. Bearing in mind the greatly increased returns of the land since 1870, the enlargement of the holdings is significant.

Before Mr. Smith's time kelp-making had been one of the most remunerative industries of the islands, and when it ceased to pay, a fishery company was formed, but soon became moribund, though the industry has since been restored to some extent. Shipbuilding was started, either shortly before or shortly after Mr. Smith's rule began, and at any rate he made it

successful for some years. The ordinary farming of the period, chiefly consisting in the growth of small areas of corn and a few potatoes, and the keeping of stock on the grass land, was not very profitable; and the first extensively advantageous change which the Lord Proprietor induced the farmers to make was gradually to convert their farms into market gardens, for the production of early potatoes, asparagus, seakale, and other crops. The earliness of these products rendered them exceptionally profitable, and for many years the Scillonians were prosperous market gardeners of the old kind, as producers of culinary vegetables. A still more advantageous change, however, was yet to come.

In 1870, or a year earlier or later (strangely enough the date of the important event has not been precisely recorded), the father of Mr. Allen, the present steward, packed for the late Mr. Augustus Smith, then Lord Proprietor, a box of narcissi, and sent it to Covent Garden, receiving 1*l.* in return. When this became known, a few of the farmers began quietly to collect bulbs wherever they could find them growing in the fields or hedgerows, and to cultivate them so as to increase stocks, getting a few flowers for market in the meantime.

The varieties growing in the islands at the time, as stated by Mr. T. A. Dorrien-Smith, the present Lord Proprietor, in a paper read before the Royal Horticultural Society in 1890, were the old double daffodil (*Telamonius plenus*), Campernelli, Scilly White, Grand Soleil d'Or, two varieties of Grand Monarque, Bifloris, Poeticus Recurvus, and Poeticus Flore Pleno. How the bulbs were introduced is not certainly known, except that Campernelli was raised from two bulbs presented to Mrs. Gluyas, the wife of a Scilly resident, nearly sixty years ago by the captain of a French vessel. Mr. Dorrien-Smith is of opinion that the rest were introduced by the Governors, as the greatest numbers were found around their former country seat in St. Mary's, or they may have been brought to Tresco first by the monks who once resided there.

In 1875, when Mr. Dorrien-Smith took up his residence in Tresco, the demand for flowers was still small, and prices were not tempting enough to induce the Scillonians to grow them upon a large scale. It was not until 1880, about ten years after the few pioneers commenced operations, that the industry became thoroughly remunerative, and even then the production was small.

In 1883 Mr. Dorrien-Smith went to Belgium, Holland, and the Channel Islands to obtain information as to the cultivation of the narcissus. In the Channel Islands he found the people devoted chiefly to the production of grapes, potatoes, and other vegetables, and growing very few flowers; while in Belgium

and Holland narcissi were a month later in flowering than in Scilly. Hence he concluded that it would be safe to extend the cultivation of these flowers, and he bought bulbs extensively for himself and his tenants. From that time the cultivation of the narcissus rapidly extended, and many new varieties were introduced, very high prices being paid for some of them.

In 1885 the Bulb and Flower Association was founded by Mr. Dorrien-Smith, to promote the growth of the flowers by holding annual shows and otherwise. By that time the exports of flowers from the Scilly Isles had become considerable, amounting to 65 tons in the year, and the quantity increased to 85 tons in 1886, to 100 tons in 1887, to 188 tons in 1888, and to 198 tons in 1889. Exports steadily increased up to 1893, when they reached 448 tons, after which there was a falling-off, due to variation in the crops; but the climax was reached in 1896, when 514 tons were exported.

It is worth while to pause for a moment to consider what 514 tons of flowers represent. The steamship owners roughly allow eight boxes to the cwt., or 160 to the ton, the weight of the boxes being included. According to this calculation, 82,240 boxes of flowers, which in the case of narcissi contained 21 to 51 bunches (of twelve flowers) per box, and in that of anemones 72 bunches, were sent out of the Scilly Isles in 1896. One grower, who appears to have larger boxes than those referred to above, says that he packs 36 to 100 bunches in a box; but the precise accounts kept at Tresco have enabled Mr. T. G. Brown, farm manager to Mr. Dorrien-Smith, to favour me with the statement that the number of bunches of flowers of all kinds averages about 7,000 to the ton of flowers and boxes, and 514 tons would therefore be equivalent to about 3,598,000 bunches.

The flower crop in 1897, although a good one, was not so heavy as that of 1896, and the exports fell off to 476 tons. For the present year they will be much smaller in quantity, the crop having proved the worst ever grown, taking yield of flowers per acre. Various reasons for this comparative failure are given, chiefly in relation to climatic vicissitudes in the two preceding years. Certain captious critics attribute it to bad cultivation; but a very small amount of consideration should have been necessary to convince them that a sudden deficiency after years of abundance cannot be mainly the result of faults on the part of the growers. That there are bad as well as good cultivators of bulbous flowers in the islands is admitted by Scilly authorities; but, as even the best growers had a poor crop this season, there must have been some cause apart from cultivation to account for the deficiency.

In 1870, according to Messrs. Scott and Rivington, the early potato crop formed the main support of the Scillonians; and, as in the Channel Islands, mangels were often grown after it in the same season. Asparagus was also grown for the London market. Wheat, barley, rye, oats to a small extent, and clover extensively were produced at that time, mixed "seeds" being allowed in some places to remain down for three years. Even in 1890, when Mrs. Brewer's article was written, although corn and "seeds" had greatly diminished in area, to make room for flowers, over a thousand tons of potatoes were exported, while asparagus and seakale were produced somewhat extensively. At the present time no wheat is sown, and barley and oats are produced only for the feeding of live stock, while asparagus has ceased to be produced for market, and seakale is grown only to a quite insignificant extent. Even early potatoes, favourable though the climate of the islands is for their production, as they have often been dug as early as the first week of April, and occasionally in the last week of March, are grown much less extensively than they were produced when Mrs. Brewer wrote. There are not over thirty acres in St. Mary's this year, and although the crop is produced more extensively in proportion to total area in Tresco and Bryher, the total acreage has been much reduced. In all the islands it is about 125 acres this year. Profitable as potatoes and other vegetables were—so profitable that a family, according to Messrs. Scott and Rivington, could live comfortably on the returns of five acres—flowers appear to pay better, or they would not have encroached upon the area formerly occupied by the other crops. It is to be observed that the freight on potatoes sent to London averages about 3*l.* a ton from the different islands, and this is a considerable disadvantage. Still, bearing in mind the earliness of the Scilly potato crops, and the high prices usually obtained for the first open-air supplies, the Scillonians will always have a good resource in the cultivation of culinary vegetables if the flower supply should be overdone.

The extent to which flowers are grown is about 400 acres in St. Mary's, 43 acres in Tresco, 30 in St. Martin's, 15 in St. Agnes, and 15 in Bryher, making about 503 acres altogether, all but a comparatively small proportion of the area being devoted to the narcissi.

A few years ago large quantities of wallflowers and stocks were grown in St. Mary's, the former flowering in February or March, and the latter a little later. But now the quantities of these flowers produced in the Scilly Isles are small. The several varieties of the narcissus make up the bulk of the

market flowers, the only others of importance being gladioli, anemones, marguerites, and arum lilies, though a few freesias Spanish irises, and white pinks, as well as the small quantities of wallflowers and stocks already mentioned, are also grown.

Bulbs have not been exported to any great extent from the Scilly Isles. The newer varieties have been for the most part kept to increase the extent of their cultivation, while the common sorts are worth only 15*s.* to 30*s.* a thousand, the buyers, I believe, paying the freight to the various destinations. There is no considerable demand for the bulbs of some of the varieties most extensively grown in the Scilly Isles, and notably the polyanthus varieties, as they are not cultivated for market at all commonly on the mainland. Besides, although some of the Scillonians grow bulbs well for market, this cannot be said of the majority.

Mr. T. G. Brown has kindly prepared for me the following list of varieties of the narcissus grown in the Scilly Isles, distinguishing the daffodil and the polyanthus varieties from the others :—

DAFFODILS.

Telamonius (the old double daffodil)	Grandis.
Emperor	Rugilobus.
Empress	Princeps.
	Obvallaris.

POLYANTHUS VARIETIES.

Scilly White	Gloriosus.
Grand Monarque	Jaune Suprême.
Soleil d'Or	Mozart Orientalis.

OTHER VARIETIES.

Sir Watkin	Orange Phœnix.
Incomparabilis (single)	Sulphur Kroon.
„ (double)	Barri Conspicuus.
Cynosure	C. J. Backhouse.
Stella	Ornatus (*Poeticus ornatus*).
Leedsii varieties	Poetarum.
Frank Miles	Poeticus Plenus (double Pheasant-eye)
Odorus Major (Campernelli)	

Six of the original Scilly varieties are in this list, three being polyanthus varieties. A few other varieties were noticed in visits to some of the principal growers, to be mentioned hereafter.

The violence of the frequent gales of wind renders shelter for the flowers necessary, and this is provided by fences usually consisting of veronica, escallonia, or euonymus, all three of which flourish in the islands, and are to be found in some places growing to a great height.

Scilly growers have at least three great advantages in the production of bulbous flowers. The first and greatest is earliness of production; the second is suitability of soil and abundance of sunshine for bringing the flowers to a perfection of size and colour; and the third is suitability of soil and climate for promoting a good increase of bulbs. That these natural advantages are partially counteracted by careless cultivation on the part of some of the growers does not, of course, disprove their existence. On the other hand, the growers have two disadvantages, the heavy cost incurred and long time occupied in conveying the flowers to market. The freight from St. Mary's to London is 8*s.* per cwt., and from St. Martin's (and presumably from the other outlying islands) it costs those who do not carry their own produce 1*s.* 6*d.* per cwt. extra to convey it to the quay at St. Mary's. Half the freight from St. Mary's to London is swallowed up in steamer freight, quay dues at starting and on reaching Penzance, and cartage to Penzance station. Bearing in mind the fact that about one-third of the weight on which the freight is paid consists of boxes, it will be seen that this is no slight tax upon the returns; and, in addition, there is a commission of 10 per cent. on the prices realised to pay the salesmen (or 5 per cent. if growers find their own boxes), with other charges, including the cost of returning empties, which are debited to the growers by the salesmen. As to the time occupied in conveyance to market, the steamers run to Penzance only three times a week in the height of the flower season. This by itself is a disadvantage in periods of sunshine, when flowers expand quickly; but it is not all. Flowers loaded on the steamer at St. Mary's on one morning are not in Covent Garden until the next day, when they reach Paddington at 4 A.M. Consequently varieties of flowers which do not travel very well are sometimes in deteriorated condition when exposed for sale. Nothing, however, entirely counteracts the advantage of early production.

The supply of narcissi from the Scilly Isles begins with a few forced flowers at or before Christmas, while the earliest open-air varieties are usually ready at the beginning of January, occasionally in December, or in very backward seasons at the end of January, and successive varieties are sent to market up to about the end of May. Marguerites flower in the open all the year round; anemones (*fulgens*) from December to March; wallflowers, as already stated, in February and March; arums, which withstand the winter in the open in Scilly, begin in April or May usually, but this year started in March; scarlet ixias, in May; gladiolus and iris in June, with which month the flower

season ends. These are the usual dates of flowering; but, it is hardly necessary to say, they vary with the seasons.

While most of the growers who produce any considerable quantity of flowers possess one small unheated glass-house, in which they keep their flowers for a day or two before packing them, the area of hot-houses in the Scilly Isles is not large. Mr. Dorrien-Smith, in Tresco, has by far the greatest extent, namely, 28,800 square feet covered with glass. In St. Mary's only five farmers have any considerable extent of hot-houses; in St. Martin's only three have even a small extent; in St. Agnes only one; and in Bryher, none.

As the narcissi are picked as far as possible before the blossoms have expanded, a small glass-house is necessary for the proper preparation of the flowers for market. On being brought in from the fields, they are placed in whole-bottomed flower-pots containing water, in which they expand, and in some cases the water is warmed. The flowers expand better than they would in the fields, and travel better for being kept in water a short time, though this process is often overdone. Most of the hot-houses are used for forcing narcissi first, and for tomatoes afterwards. The extent to which tomatoes are produced in Scilly will be referred to in a subsequent division of this report. The narcissus is the only flower forced, I believe, and the quantity thus treated cannot be very great. The varieties used for forcing by Mr. Dorrien-Smith are Soleil d'Or, Scilly White, Telamonius, Obvallaris, Gloriosus, Rugilobus, Grand Monarque, Princeps, Cynosure, Incomparabilis Plenus, Orange Phœnix, and Ornatus. All kinds will force, Mr. Brown says, but some much better than others.

As the great advantage of the Scillonians consists in being able to produce flowers cheaply in the open-air as early as they can be obtained by forcing on the mainland generally, it is questionable whether there would be much or any benefit in the extension of hot-houses. I am disposed to think that unheated glass-houses, such as are common in Guernsey, would be more economically advantageous. As this question is to some extent connected with the conditions under which land is held in the islands, it will not be out of place to write a few lines upon that subject.

The tenure under which the farms of the Scilly Isles are held is practically hereditary, and in some cases holdings have been in the hands of the same families for two or three hundred years. Although the agreements are yearly, and in most cases, I believe, verbal, evictions are almost unknown. Security for improvements rests mainly upon confidence in the perma-

nence of the hereditary custom, though Mr. Dorrien-Smith invites his tenants to make known their desires as to improvements, with a view to arrangements as to compensation. Apparently the tenants are well contented with the friendly arrangements made between themselves and their landlord. As a farm almost invariably descends to a relative of a deceased or retired tenant, there is no competition as to rents, which range from 2*s*. 6*d*. per acre for rough grazing land to 3*l*. for land suitable for flowers and in favourable positions. Although, instead of falling, as in most parts of the country, rents have risen in the Scilly Isles, they appear to be moderate under all the circumstances, including heavy and continuous expenditure on the part of the landlord for the advantage of the people. Rates are moderate, and there are no licences in Scilly. In this connection it may be mentioned that the general prosperity of the people is indicated by almost entire absence of pauperism. Each island supports its own poor, and there are now only five paupers in St. Mary's, one in Tresco, one in St. Martin's, and none in St. Agnes or Bryher.

The cultivation of the narcissus is comparatively simple, when once it has been ascertained whether any specified variety will flourish in a particular soil or climate. In Scilly the bulbs are usually planted in October, the small sorts about 4 inches by 2½ inches or 3 inches apart, and large bulbs about 6 inches by 4 inches to 6 inches. In some cases the land is carefully weeded up to the time of flowering, while in others it is left untouched during the growing season, so that it becomes covered with weeds. The manure most extensively used is a compost of seaweed, farmyard manure, earth, and road-scrapings, nitrate of soda or guano and bones being also used by some growers. Mr. Dorrien-Smith and other careful growers manure heavily for the preceding crop—usually potatoes—and then, as they do not allow their bulbs to stand more than two or three years, no direct manuring of the flowers is necessary as a rule, though artificial manure is applied if they seem to need it. This plan is considered preferable to the direct manuring of the flower crop. But the majority of the growers allow at least some varieties of their bulbs to stand six or seven years, or even longer, and in such cases the crops may require supplementary manuring, though they do not always get it. The Scilly growers have been censured for allowing their bulbs to stand so long, and there is no doubt that the crops become overcrowded under such circumstances, with deterioration in the sizes of bulbs and flowers alike as the result. But the saving of the expense of digging up and

replanting is a great consideration, and the polyanthus varieties, which are usually left standing longest, are said to deteriorate less on that account than the daffodils or some other varieties of the narcissus. Still the best growers maintain that no variety should be allowed to stand longer than three years, because, apart from the deterioration caused by the overcrowding of the increasing bulbs, a frequent change of soil is needed for the narcissus as much as for other crops. The different varieties of flowers are picked, as already stated, from the beginning of January, or occasionally a little earlier or later, until June, expanded in glass-houses, tied in bunches of twelve, packed in boxes, and shipped to the great markets of England and Scotland. The leaves, when they have died off, are removed, and sometimes used as food for cattle. If the crop is to stand, the soil over the bulbs is cultivated during the summer in order to kill the weeds. For transplanting or marketing the bulbs are taken up in June.

Picking is mostly done by men, and bunching by women and girls, assisted by men in their overtime when work is in full swing. Men's wages are 15*s.* a week; but they earn a great deal extra by bunching and packing by the piece in their overtime. Their regular hours are from 8 A.M. to 5 P.M. in the winter half of the year, with an hour for dinner, and from 6 A.M. to 6 P.M. in the summer half, with time for breakfast as well as for dinner.

The expense of growing narcissi is one of the questions as to which growers are naturally reticent, and inquiries upon that point could not fairly be pressed, though growers are occasionally invited to disclose even more delicate particulars of their private affairs—as, for example, in the case of a leading Scillonian who recently received a letter from a lady, unknown to him, asking him how much his income was. The expense of cultivation varies greatly with the time during which crops stand, and with the cost of bulbs, some of which are purchased at very high prices, while others are simply the increase of crops grown in the islands, and worth very little to sell, if they can be sold at all. If a statement made by a grower on the mainland may be accepted as accurate, to the effect that 240,000 of small varieties of bulbs are required to plant an acre, or about half as many of the largest, it may be readily imagined that the cost of planting even home-grown bulbs is by no means small, and that it is very heavy when varieties by no means the newest are purchased at 3*l.* to 10*l.* per thousand. With respect to new hybrids there is, of course, no question of planting by the acre, as they frequently command 5*l.* to 10*l.* per bulb, and I have seen one

for which fifty guineas was refused. In the past very high prices were paid by enterprising Scilly growers for varieties now comparatively common, such as Emperor, Empress, and Sir Watkin. One grower informed me that he had paid 50*l.* to 80*l.* per 1,000 for such varieties a few years ago, while another said that he had bought Sir Watkin at 30*l.* earlier than the neighbour who said he had paid 80*l.* This discrepancy I am not able to clear up; but when Scilly growers bought bulbs at even 30*l.* per thousand, it is to be presumed that they planted only a few rods of land with them, and extended the area as the bulbs increased. The expenses of manuring, cultivation when properly done, picking, raising and collecting bulbs, packing, freight, and marketing bring the cost of growing narcissi up to a large sum per acre.

With respect to the returns, they vary enormously with crops and prices. A high authority informed me that a good crop of a particularly free-flowering variety at 1*s.* 6*d.* per dozen bunches would give a gross return of 100*l.* per acre; and probably choicer and less productive kinds, sold at higher prices, make quite as good returns. But prices fell alarmingly in 1897, and, although they were much better in the early portion of the present season, they have been extremely low at times since the end of March. Some details as to the fall in prices will be given presently in the evidence obtained from growers.

My visit to the Scilly Isles was made in the middle of March, and the earliness of production is indicated by the statement that by that time most of the varieties of the narcissus extensively grown had been marketed. Mainland growers will understand this earliness when it is stated that more than half the crop of Grand Monarque and about half that of Empress had been disposed of before March 14, while Ornatus was just beginning to come into bloom in places. In consequence of the mildness of the winter the early varieties were ready a little sooner than usual, while the late sorts were checked by the cold weather of March. In the preceding remarks I have given to a great extent the information obtained during my stay in the islands; but it remains to give a brief account of my visits to typical farms.

Mr. Martin John Sutton kindly supplied me with introductions to Mr. Dorrien-Smith and two other large growers of flowers, one of whom, Mr. E. W. Banfield, met me shortly after my arrival, and drove me to his farm at Holy Vale, St. Mary's. This farm, of 30 acres, about 12 acres of which are occupied by flowers, has been in the hands of Mr. Banfield's family for

three hundred years. After walking through the flower fields, protected by excellent fences of veronica or escallonia, and noticing the flourishing appearance of the narcissus plants, I was shown a beautiful display of cut blossoms of several varieties, expanded in a glass-house, and ready for packing. In one day Mr. Banfield has sent away 3,500 bunches of a single variety. There were also some beautiful deep-red anemones and a few wallflowers. Noticeable in Mr. Banfield's garden were some fine Dracæna palms, of New Zealand extraction. Grown from seed, these palms flourish in Scilly, and become fine trees. In calling my attention to some pretty and strongly-scented freesias, Mr. Banfield said that they were not all popular in the market. In one enclosure the farmer's familiar enemy, twitch, is troublesome; but this fact is interesting only on account of its having been the means of disclosing a name new to me for this grass, which is locally termed "yaw." Where the bulbs are allowed to stand for six to eight years, this weed often gains a strong foothold in the soil. Referring to the mildness of the Scilly climate, Mr. Banfield said that the narcissus crops had never been killed by frost. They have been frosted, but have always recovered. The land has hardly ever been too much frozen for the plough to work. Four men are employed regularly upon the farm, with extra hands in the flower-picking season.

Mr. W. M. Gluyas, J.P., of Field House, St. Mary's, who is Dutch Consul for Scilly, as well as a flower-grower, was next visited. He has 36 acres of cultivated land, including about 10 acres of flowers, with 100 acres of rough grazing land. Among the first things noticed on this farm were Berberis Darwinii in full blossom (on March 14), and the arum lily (*Calla æthiopica*) flourishing rampantly in the open ground, and just coming into blossom two months before its usual time. The flower (narcissus) season started this year, Mr. Gluyas stated, at Christmas, though the beginning of January is a more common time for the first open-air supply, and in late seasons picking does not begin until February. He started this season with Soleil d'Or, and Scilly Whites were ready at the beginning of February, a few weeks earlier than usual. The old double daffodil began to bloom at the end of January, and wallflowers in February. Mr. Gluyas also grows Anemone fulgens and double white stocks, ready in March; and Spanish irises and scarlet and white gladioli, which begin to bloom in May in early seasons, though the latter are more frequently June flowers. Although he is a fancier of roses, and grows them in his own garden, Mr. Gluyas said that they did not flourish in the Scilly Isles, as the soil did not suit them. Five men and one boy are employed regularly on

this farm, and a few extra in the flower-picking season, with some women and girls to bunch and help pack.

With respect to the freight of 8*s*. per cwt. on flowers from St. Mary's to London, about 350 miles, Mr. Gluyas compared it with 6*s*. to 7*s*. for conveyance from 700 to 800 miles from the South of France, and 4*s*. as the freight from the Channel Islands.

Mr. Mumford, of Old Town, St. Mary's, has about fifteen acres of open-air flowers, and some fine hot-houses in which he forces narcissi in the winter. His first supplies of forced flowers were ready this season a little before Christmas. The plants are kept out of doors, after being potted in the summer, until November, when they are taken into the hot-houses. They will not bear forcing from the first. As an example of the fall in the prices of varieties once rare, but now grown very extensively, Mr. Mumford said that seven or eight years ago Ornatus sold at 12*s*. a dozen bunches, whereas it now frequently realises only 1s.

The most extensive grower of flowers in St. Mary's is Mr. Francis Watts, of Old Town, who holds 80 acres of land, besides some rough grazings, 30 acres being occupied by bulbs. Ten men are regularly employed on this farm, extra men and women being required in the flower-selling season to do the bunching. Mr. Watts says that bulbs should not be allowed to stand more than three years, as they get overcrowded when they are left for six to eight years, and the blossoms are in consequence smaller than they should be. The crop should be changed to potatoes, heavily manured, after which bulbs may be planted again. Mr. Watts has hot-houses in which he forces narcissi. He grows in the open, besides the narcissus, the anemone, iris, marguerite, gladiolus, and a few other flowers. As an indication of the varieties of narcissi and other flowers ready for market in the several months of the flower season, Mr. Watts obligingly read out to me from his account book the names of those sent away last season, as follows :—

December.—Anemones grown in the open, and ready this season on the 13th, earlier than usual; Soleil d'Or and Scilly White narcissi from the hot-house, ready on the 22nd.

January.—Anemones again, and the Telamonius (old double daffodil), Obvallaris, Soleil d'Or, Scilly White, Paper White, and Gloriosa narcissi, grown in the open, as all named below were also.

February.—Telamonius, Scilly White, Princeps, Single Incomparabilis, Henry Irving, Soleil d'Or, Obvallaris, Golden Spur, Countess of Annesley, Empress, and Sir Watkin narcissi.

March.—February varieties repeated, with Emperor, double Incomparabilis, Grand Monarque, Orange Phœnix, Orange Kroon, and Grandis.

April.—Bifloris Poeticus and Double White narcissi.
May.—Scarlet Ixias and Double White narcissi.
June.—The Bride gladiolus and the Spanish iris.

It will be seen that Mr. Watts grows a great number of varieties of the narcissus; but the list is not given as an exhaustive one of his flowers—as, for example, it does not include any marguerites or scarlet gladioli. Some very fine and beautifully coloured varieties of narcissi were ready for packing on the occasion of my visit.

Mr. Barnes, of Normandy, St. Mary's, farms 44 acres of land, 16 acres of which are under flowers. He informed me that he was one of the few growers, including Mr. Richard Mumford and Mr. Trevellick, who began to collect the bulbs growing wild in St. Mary's in or about the year 1870, though it was two or three years before he sold any flowers in the market. Mr. Barnes's flowers are grown in small enclosures sheltered by very high and luxuriantly growing fences, and his beds are kept admirably free from weeds. Some of the bulbs are grown between and under fruit trees, and they have a flourishing appearance. Guano and dissolved bones are used as manures. The newer varieties of narcissi are allowed to stand only three or four years, but Scilly White and other old kinds six or seven years. Mr. Barnes is of opinion that the common sorts (chiefly the polyanthus varieties), will stand "almost as long as you like," while Sir Watkin, Emperor, and others of the daffodil division will not do well after standing three years. Alluding to the fall in the prices of new varieties, he said that six years ago the flowers of Sir Watkin sold at 14*s*. to 15*s*. per dozen bunches, and now are worth only 3s. to 4*s*., but, of course, a great fall from the extreme prices obtained for flowers when they were rare was to be expected, and it is to be borne in mind that the bulbs were also extremely dear when growers first purchased a few of them.

Mr. Methuselah Watts, another grower of the narcissus in St. Mary's, occupies 18 acres of land, 12 acres of which are under flowers. He has a hot-house consisting of four spans 18 feet wide each, connected, and a movable glass-house, which he places over portions of his narcissus crop growing in the open ground when he desires to force the flowers. The same bulbs can be forced two years in succession when they are thus left in their original beds, whereas, when they are potted and moved to a fixed hot-house, they can be forced only once. Mr. Watts had some choice and beautiful varieties ready for packing at the time of my visit.

The last grower of bulbs in St. Mary's visited was

Mr. Trevellick, of Rocky Hill, already mentioned as one of the pioneers of the flower industry of the islands. Like other early growers, he named only four varieties as being at all common in Scilly when the flower trade was started—Scilly White, Soleil d'Or, Grand Monarque, and the common double daffodil (Telamonius). At the outset, when there were only two or three sellers of flowers in Scilly, and the market was not well prepared for narcissi, the price was about 5s. per dozen bunches; but later on, as the demand increased, the rate rose occasionally as high as 24s. per dozen bunches. Last year prices were so low that they were barely remunerative, but in the early part of the present season they were better. Many new varieties have been introduced into the islands at great expense; but Mr. Trevellick doubts whether it would not have paid best to stick to the old kinds. He grows seven acres of flowers, and had many beautiful varieties in course of being packed on the occasion of my visit. Mr. Trevellick's garden is a very interesting place, on account of its flourishing tropical, or semi-tropical, vegetation, including New Zealand palms and flax, the South African polygala ("many helmets"), the beautiful evergreen Araucaria excelsa, tree ferns, the West Indian pepper plant, and the Metrosideros robustus, which is difficult to grow even in the Scilly Isles. Fences of euonymus and escallonia 13 feet high had also a very striking appearance.

Unfortunately Mr. Dorrien-Smith was away from the islands at the time of my visit, but he kindly left instructions for every facility as to visiting Tresco and obtaining information about the Scilly Isles to be afforded to me. Mr. Allen, his steward, obligingly accompanied me to Tresco and St. Martin's in Mr. Dorrien-Smith's steam launch, and took a great deal of trouble to supply me with details concerning the industries of the islands, which were supplemented afterwards by letters from the Lord Proprietor himself.

The beautiful gardens and grounds around Tresco Abbey, Mr. Dorrien-Smith's residence, are unique in the United Kingdom for tropical vegetation. It would be pleasant to dwell upon the beauties of the exotic trees, shrubs, and flowers pointed out to me by Mr. Jenkins, the head gardener; but the space left in this Report for references to the Scilly Isles is limited, and a bare catalogue of a few of the exotics must suffice, as follows:—Anopteris glandulosus, of Tasmania; Correa virens, C. cardinalis, and C. alba, of New South Wales; Araucaria Bidwillii, A. Cookii, and A. excelsa, of Norfolk Island; Abutilon vitifolium, of Chile; Aloe socotrina, A. barbadoes, and A. spicata, of Cape Colony; Dasylirion

Acrotrichum, of Mexico; Dracæna Draco, of the East Indies and Teneriffe; Puya lanuginosa, of South America; the deciduous cypress of Japan; the Cassia corymbosa, of Buenos Ayres; the Clethra arborea, of Madeira; and a number of agaves, cordylines, Australian gum-trees, Himalayan scented rhododendrons, bamboos, and prickly pears. The African aloe (*Fourcroya longæna*) puts forth its magnificent bloom in the gardens once in fifteen years, after which the original plant, having thrown out a number of young plants, dies. It may be added that over one hundred and fifty varieties of the mesembryanthemum are grown in the gardens, about a dozen of which clothe the rocks of the Scilly Isles.

The temperature in the Tresco gardens during the twelve years ending with 1896 very rarely rose to 80° in the shade, the maximum in most years having been 75°; and the lowest temperature was occasionally down to freezing point. The average annual rainfall was 31·76 inches.

Mr. Dorrien-Smith's home farm, apart from his extensive grazing ground and the private gardens and shrubberies, is about 100 acres in extent, and, with the hot-houses for market produce, is under the management of Mr. T. G. Brown, to whom I am indebted for a great deal of information. About 40 acres are under flowers, and 30 acres under potatoes. There are only three tenants in Tresco; they grow 3 acres of flowers and 5 acres of potatoes. As evidence of early vegetation, it may be mentioned that on March 15 the most advanced potatoes on Mr. Dorrien-Smith's land were so nearly mature that Mr. Brown expected to begin raising them at the end of the month. Unfortunately the blizzard which occurred a few days later cut the tops badly in exposed situations. Still I have since been informed that some tubers were dug at the end of March, and sold at 4*d.* per lb., no doubt the earliest open-air potatoes raised in England or the Channel Islands this season. The first week in April is not an unusual time for beginning to raise new potatoes in Tresco, which is a fortnight earlier than any of the other islands in its production.

The narcissus is admirably cultivated on Mr. Dorrien-Smith's farm, as the bulbs are not allowed to stand more than two or three years, heavily-manured potatoes being grown as an intervening crop, while the flower-beds are carefully weeded during the period of growth. The number of varieties grown is shown in a statement previously given, some of them being in full beauty at the time of my visit; and, although the greater part of them had been marketed, Mr. Brown was able to favour me with specimens of twenty varieties, including some belated

blossoms of early kinds. The average weight of flowers exported by Mr. Dorrien-Smith from 1894 to 1897 was 37½ tons per annum. The extent of the hot-houses, in which flowers had almost entirely given place to tomatoes (which will be referred to in the fruit division of this report), at the time of my visit, has already been stated, and the list of varieties of the narcissus used for forcing has also been given, together with much other information obtained in Tresco, or by correspondence with Mr. Dorrien-Smith and Mr. Brown. It remains, however, to present a few illustrations of the fall in the prices of flowers more precise than those which are based on off-hand statements. Accounts are so strictly kept at Tresco that the average price of each description of narcissus in each season is shown for years past. Seeing that such a record, worked out as it is, may be regarded as unique, I copied the averages of some of the leading varieties from the accounts most obligingly placed before me.

In the first place, it is to be observed that no variety had been sold from Tresco up to the middle of March this season at less than 1*s.* 6*d.* per dozen bunches, while 4*s.* had been made of Emperor, and 5*s.* to 5*s.* 6*d.* of the earliest Ornatus. The records show that while the comparatively new varieties have fallen greatly in price, the old kinds, and especially the polyanthus varieties, have suffered much less depreciation. Scilly White, indeed, seems to have kept up its price well, as its averages for the eight years, 1890–97, were respectively, per single bunch, in pennies and fractions, 1·44, 1·57, 1·60, 1·29, 1·30, 1·85, 0·97 and 1·51. Here we find the highest average for 1895, while even in 1897, notably a year of extremely low prices for narcissi generally, the average was 1·51*d.* per bunch, against 1·44*d.* for 1890. Grand Monarque fell from 3·44*d.* per bunch in 1890 to 2*d.* in 1897, and Soleil d'Or from 2·18*d.* to 1·57*d.*, while the old double daffodil was 3·99*d.* per bunch in 1890, 2·6*d.* in the following year, 1·8*d.* in 1895, and 1·77*d.* in 1897. Taking the case of the giant of the daffodil division among varieties at all extensively grown at present, the splendid Emperor, there is a great drop to be noticed, as its average was 5·88*d.* per bunch in 1890 and 6·51*d.* in 1891, as compared with 2·52*d.* in 1895 and 2·22*d.* in 1897. Ornatus, again, a great favourite, and now very extensively cultivated on the mainland, has lost heavily in value, at least so far as Scilly growers are concerned. When it comes into flower with them abundant supplies of other varieties from the mainland are in the markets, so that it does not fully share the advantage which gives a temporary monopoly to Scilly for earlier varieties of open-air narcissi. It is to be observed that

these are the average prices of open-air flowers only, those of forced flowers, of course, being higher.

Mr. Brown is of opinion that the polyanthus varieties will be the mainstay of Scilly growers, because, he says, these varieties do not flourish on the mainland or in the Channel Islands. Mr. Martin John Sutton informs me, however, that they are produced to a considerable extent in the Channel Islands; but, while they are also grown to a limited extent on the mainland of England, I have not seen or heard of their cultivation for market anywhere but in Cornwall, and it appears that, although they can be grown elsewhere, the bulbs do not increase, so that it would not be profitable to grow them on a large scale for market.

A visit to St. Martin's did not disclose any points of interest not noticed in relation to St. Mary's and Tresco, except that a small remnant of the once somewhat extensive production of seakale was seen. Therefore this section of my report need not be extended by details relating to flower-growing in St. Martin's.

In spite of the keen and growing competition in the production of the narcissi, it appears to me that the Scilly growers, if they make the most of their opportunities, instead of relying too much, as some of them do, upon their natural advantages, will be able to hold their own; and although they may find that their profits in the future will be smaller than those of the past, there seems to be no danger of flower-growing in the climate-favoured little islands ceasing to be fairly remunerative.

Lincolnshire and Wisbech Bulb Farms.

An industry of considerable importance has risen up in the growth of bulbs and of flowers for cutting in Lincolnshire, mainly within the last twenty years. Mr. White, of Spalding, whom I visited in the middle of April on Mr. Sutton's recommendation, has been engaged in the bulb trade for twenty-four years, but has been a grower only twelve years. Forty years ago, he informed me, snowdrops were grown in the Spalding district mainly for the bulbs; but they are much less extensively grown now, as they are liable to disease when produced on cultivated land for some years. Crocuses also are less grown than they were, as the bulbs do not come large enough, and the supply is mainly obtained from Holland. Thirty years ago there was one grower of Pheasant Eye and Double White narcissi in the neighbourhood of Spalding—namely, Mr. Stevenson—but the demand was so slow that the enterprise was not remunerative.

About twelve years ago, Mr. White stated, bulb-growing received a great impetus through the introduction to the markets of new and attractive varieties of the narcissus, and he himself then started as a grower. It was found that the old double daffodil would stand forcing, and the bulbs of this variety rose in price from 6*s*. to 20*s*. per thousand. Mr. White was one of the first extensive growers of the narcissus in his district, and he now cultivates about 24 acres of flowers on his 34 acres of land, all narcissi, except a few lilies, crown imperials, irises, and gladioli. He grows about fifty varieties of the narcissus, and forces half a million per annum in his hothouses, after which he fills the houses with tomatoes, which occupy them until within a short time of the flower-forcing season. He is the only extensive grower in Spalding, though many of the cottagers grow bulbs on a small scale.

The soil of Mr. White's farm is an alluvial silt about 2 feet deep, resting on a mixture of clay and marl. It is well suited for the production of fine bulbs and flowers, and is admirably cultivated. Land close to Spalding lets at 3*l*. 10*s*. to 5*l*. an acre, the rent of farm land a little further away being much less.

Before planting his bulbs Mr. White manures the land very heavily, applying 14 to 15 cwts. of bone dust per acre, the only manure he uses, and 5 cwts. every autumn afterwards so long as the crop stands. Possibly this in some measure accounts for the luxuriant growth of his plants and the fineness of the blossoms. The land is fallowed about every fourth year, and this is the only time when it is ploughed, intermediate cultivation being done with spade or fork and hoe. Mr. White makes a point of giving each of his varieties a shift from light to comparatively heavy soil as occasion serves, as he believes that the hardihood of the bulbs is enhanced by growing them in the latter, which is only heavy in the comparative sense of that word. He begins to plant new beds immediately after lifting the bulbs from old ones in the first week of July. The largest bulbs, such as those of Sir Watkin, are planted 5 inches apart in rows 10 inches wide, and smaller bulbs 4 inches generally, but 3 inches in some cases, in rows 9 inches wide. The drills for the bulbs are opened with a fork, women placing the bulbs, and a man covering them. The crops are carefully weeded during the growing season. Twelve men are employed in the winter and twenty to twenty-five in the spring and summer, with about twenty women in the planting and picking seasons. Wages are 3*s*. a day for men, or 4*s*. for a few, and 1*s*. 4*d*. to 1*s*. 6*d*. for women. Farm wages in the district are 2*s*. 3*d*. a day.

Some idea of the cost of growing the narcissus may be formed from rough estimates given verbally by Mr. White. Supposing 200,000 bulbs of moderate size to be planted on an acre, costing 4*l.* per thousand, and allowing 40*l.* an acre as the cost of manuring, cultivating the land, planting, weeding, picking, and marketing, the total would be 840*l.* per acre. Probably rent, rates, and taxes are included in the 40*l.* Some varieties of bulbs cost a great deal less and some a great deal more than 4*l.* per thousand, and Mr. White makes the total expenses per acre range from 400*l.* to 1,000*l.* But these amounts apply only to the first year, even to growers who have to buy their bulbs, as the bulbs usually stand from two to three years, the extremes being one to four years on the farm in question. Therefore the average annual expenses would be very much less than the amounts given. Again, growers would not find a market for all the bulbs they grow, and, therefore, when they produce their own bulbs for planting, these should not be valued at the selling price in reckoning the actual cost of production. If a grower bought 200,000 bulbs at 4*l.* per thousand, the cost might be spread over three years, making it about 266*l.* per annum, while the cost of planting could be similarly treated. Whatever the precise amount per annum might be, however, it is clear that the annual returns from flowers and those obtained from bulbs at the end of three years would need to be very large to cover expenses and afford a profit.

At the present time Mr. White has in growth 1,500,000 bulbs of Ornatus, between 400,000 and 500,000 each of Sir Watkin and of Horsfieldi, 750,000 of common double daffodils (*Telamonius plenus*), 1,000,000 Double Whites, 100,000 each of Emperor and Grandee, 40,000 of Empress, and a number of other varieties. He usually begins to pick forced flowers in the first week of January, and finishes at about the end of February or early in March, when the open-air flowers are ready. To show the difference of time between the flowering in Scilly and in Lincolnshire, it may be pointed out that whereas Mr. White began to pick Emperor and Empress only on April 7 or 8, the whole of the former and about half of the latter had been marketed from Tresco by March 14. Again, the old double daffodil was ready in Scilly at least two months before it was at Spalding this year, and Ornatus one month earlier. Moreover, the first open-air flowers in Scilly were picked quite as soon as the first forced flowers at Spalding.

Mr. White has planted some of his bulb land with apple trees, 30 feet apart each way, which is a good plan of insurance against loss in the event of the narcissus market being overdone,

especially as the bulbs appear to do very well between trees, and even to grow fairly under them. That the industry is likely to be overdone in the course of a few years is Mr. White's opinion. As there is only a limited demand for bulbs, he says, growers are tempted to keep on increasing their acreage in order to use the bulbs which they cannot sell, and most of them, he believes, are doing so, as he himself is. Perhaps he was depressed by the extremely low returns received from a large quantity of flowers sent to the northern English and Scotch markets to be disposed of on the Saturday before Easter Sunday, when there is usually an extra demand. The prices realised for even such fine varieties as Emperor, Empress, Sir Watkin, and Horsfieldi were only 6*d.* to 1*s.* 3*d.* per dozen bunches, with expenses to come off. They were splendid flowers to be almost given away, as I can testify from a beautiful collection of most of these and some other varieties ready for market at the time of my visit. This, however, was because too many growers kept back their supplies for the Easter market, prices having been much better, though low, just before and after that market. The London market at Easter was not quite as bad as the northern markets were. The freight on flowers from Spalding to London is 2*s.* 4*d.* per cwt.

As an example of the fall in the value of bulbs which were rare a few years ago, but are now comparatively common, Mr. White said that some varieties which sold at 50*l.* per thousand seven years back had come down to 3*l.* or 4*l.* Only about half the bulbs taken up are good enough for the great seedsmen. If the rest are sold at all, they are disposed of to hawkers, who buy them at very low prices. On the other hand, if the small bulbs are planted, they produce very few flowers in their first season. Of this fact an illustration was to be seen at the time of my visit.

Messrs. Barker & Co., of Frampton, near Boston, were next visited. Mr. Barker began to grow the narcissus for market sixteen years ago, and he is one of the earliest commercial growers in his district. When he started, the demand for flowers and bulbs alike was small, and, although it has grown enormously since, he thinks the supply is now too great for it. He grows 5 acres of narcissi, including many of the choicest varieties, in an excellent alluvial soil of considerable depth, admirably suited for bulbs. Land in the district sells at 20*l.* to 120*l.* an acre, the latter price being commanded for land suitable for bulbs or early potatoes and other market garden crops. The bulbs are planted in rows 9 inches apart and 3 inches apart in the rows, and they stand from two to four years

according to circumstances, early potatoes following them. The cultivation is excellent, and the growth of the plants was very luxuriant at the time of my visit, while the flowers were remarkably fine. A few open-air blooms were picked this season on February 28, and picking goes on until the middle of May, when roses become abundant in the market. Mr. Barker and his partner force a good many narcissi, and these they begin to market usually in the last week of the old year. It is not considered worth while to have any ready before Christmas, as the market is full of chrysanthemums up to that time. They also force about 10,000 lilies of the valley and about 2,000 spireas.

Besides narcissi, a few thousands of crown imperials and some aconites are grown in the open ground; also a small bed of the Scilla italica (hawthorn-scented squill), very pretty and sweet. Mr. Barker said that tulip bulbs could be produced very well in his soil; but as good sorts could be bought at 8*s.* a thousand in Holland, or at 10*s.* delivered in England, it was not worth while to grow them. He confirmed Mr. White's statement as to the decline of the cultivation of snowdrops in Lincolnshire, on account of the bulbs becoming diseased. His theory is that the bulbs decay through the wet getting into them where the stalks of the flowers are picked off. In reply to an inquiry as to the possibility of growing the polyanthus varieties of the narcissus in Lincolnshire, Mr. Barker said he had tried all the chief sorts, and that, although they bloomed well at first, they soon turned sick, and the bulbs decreased instead of increasing. This confirmed the statement of a Scilly grower, already mentioned.

There are many other growers of bulbs around Boston, including Mr. Brown, of Swineshead, who is an extensive producer of flowers and fruit. Some of the farmers cultivate several acres of bulbs, and a good many cottagers grow a few, chiefly of the common sorts.

Another excellent example of a bulb farm is that of Messrs. Richard Bath & Co., of Wisbech. This, however, is a bulb farm and something more, for many other flowers besides bulbous varieties are grown on about 50 acres of a farm of 450 acres held by the firm, the rest being devoted to fruit. Mr. Bath settled in Wisbech fifteen years ago, and now he and a partner and the company of which he is the senior partner together hold about 900 acres, mainly planted with fruit and flowers. The soil is a fine silt, of alluvial origin and of great depth. Such land in the district, suitable for flowers or fruit, before being planted lets at 3*l.* an acre, and sells up to 100*l.*, while planted land is worth 8*l.* an acre to rent.

Mr. Leak, the foreman of the flower division of the farm, obligingly showed me all that was to be seen in his department. There are fifteen acres of narcissi, including some of the choice and new varieties, such as Glory of Leiden, a magnificent daffodil bigger than Emperor; Madame Plemp, a grand bicolour, the bulbs of which cost 10*s*. 6*d*. to 25*s*. each when purchased; Victoria, another very large flower; Weardale Perfection, two bulbs of which cost 20 guineas; and Gloria Mundi, with its splendid deep orange cup. The full-sized bulbs are planted 4¾ inches apart each way in beds, Dutch fashion. I was shown one bed of Sir Watkin from which, it was stated, an average of ten blooms per bulb had been picked. Bulbs are planted in October, and lifted in July when to be sold. The lovely Golden Spur, usually very early, had not ceased blooming on the occasion of my visit, and Maximus, of a richer yellow, but smaller, also showed its beauty. Emperor, Empress, and Horsfieldi flourish splendidly on the farm, as was indicated by the great size of the blossoms. Barri Conspicuus also does remarkably well there, and Mr. Leak said he wanted 20,000 bulbs to plant. Obviously the bulbs are very well cultivated. Tulips are also grown for cutting.

A field of roses, containing 120,000, attracted my attention, and near by were large beds of pansies, polyanthuses, wall-flowers, violets, and carnations. About 12,000 carnations, which Messrs. Bath regard as an important feature of their business, are grown in pots, besides about 30,000 in the open ground. In the hot-houses the first plant noticed was the clematis, fifty varieties of which are grown, and 40,000 plants were sold last year. Dahlias are also very extensively produced. About 7 acres are planted for stock, and the roots are drawn out for propagation, nearly 80,000 having been sold in pots last year. Of cannas 15,000 were being grown. Most of Messrs. Bath's cut flowers are sent out in rail parcels or by parcel post to consumers in all parts of the country, while plants are sent to nearly all parts of the world.

The concluding portion of my report on flower growing will appear in the September number of the Journal.

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THE SOURCE OF MILK FAT.

THE source of fat in the animal body has been in the past a subject of much controversy. That animal fat is derived from the food which the animal consumes is obvious; this food also frequently contains too small a quantity of ready-formed fat to account for the amount stored up by the animal. We are therefore driven to assume that the animal body is capable of producing fat from some of the other constituents of the food. The controversy has chiefly turned upon the point whether animal fat is derived from the albuminoids, or from the carbo-hydrates of the food.

At one time the very influential German school of investigators were almost unanimous in believing that the fat produced by the animal was in all cases derived from the albuminoids in the food. This doctrine greatly affected their practical teaching. As the albuminoids in the food were the materials out of which all the animal tissues were constructed, and were in addition assumed to be the source of the fat deposited in those tissues, they came to be regarded as the chief factor in a nutritive diet, and the richer a diet might be in albuminoids the more nutritive (within certain limits) was it supposed to become. Diets containing a high ratio of albuminoids to non-albuminoids were thus recommended for all animals rapidly increasing in frame or producing fat or milk.

It is now probably universally acknowledged that, in the case of a fattening herbivorous animal, a large proportion of the fat is derived not from the albuminoids but from the carbo-hydrates of the food. This fact was first certainly established by the experiments at Rothamsted with pigs. To obtain an unmistakable answer to a question of this character the conditions of the experiment must be carefully chosen. The pig was an animal producing fat at a rapid rate, and one well suited to consume barley meal, maize meal, and other foods relatively poor in albuminoids, but rich in starch. As soon as a careful quantitative experiment was made with a pig on such a diet, the evidence in favour of the production of fat from carbo-hydrates became overwhelming.

The German school of investigators now admit that the body fat of oxen, sheep, and pigs may be largely derived from the starch, sugar, and other digestible carbo-hydrates of the food, but this alteration of theory they have not extended to the case of milk; the fat of milk is still regarded as derived from the albuminoids, or from the albuminoids and fat of the food. The

views of the German school are those adopted by several prominent teachers of dairy science in this country. When such views are held, great stress is naturally laid on the necessity for a very liberal supply of nitrogenous food to a cow in full milk. The theory is so far supported by experience that it has been frequently observed that an increased flow of milk has been obtained by increasing the albuminoids in the diet. The fact that a diet rich in albuminoids is favourable to high milk production does not, however, prove that the fat of milk is derived from the splitting up of albuminoids in the body.

American experience has thrown a considerable amount of light upon the question before us. In the United States oil-cake and leguminous seeds are used in very small quantities as food for cows or cattle, a diet for dairy cattle usually consisting of maize silage, timothy or clover hay, and wheat bran, with probably meal from maize, oats, or barley in addition. With such a choice of foods, the quantity of albuminoids supplied to the cow is distinctly smaller, and the supply of digestible carbo-hydrates distinctly larger than is usual in this country or in Germany. In 1892, and again in 1893, the authorities of the Experiment Station of Wisconsin, collected the dietaries of 128 dairy herds, distributed over a wide range of States; the herds included about 3,500 cows. These herds were above the average in excellence, the average annual yield of milk per cow exceeding 6,000 lb., while the butter yield amounted to about 300 lb. The large proportion of butter to milk was due to the large number of Jersey and Guernsey cows included in the herds. The average amount of food constituents supplied per 1,000 lb. live weight of cow to produce these results is given by F. W. Woll in the "Wisconsin Report for 1891," p. 111, as follows:—

Average American daily ration for Dairy Cows of 1,000 lb. live weight.

Total organic matter	Digestible matter				Ratio of nitrogenous to non nitrogenous substance
	Nitrogenous substance	Fat	Carbo hydrates	Total	
lb	lb	lb.	lb	lb.	
24·51	2·15	·74	13·27	16·16	1 : 6·9

Is the amount of albuminoids supplied in this average American diet sufficient to account for the butter annually produced? We have, in the first place, to deduct from the nitrogenous

substance[1] supplied 0·4 lb., this being the minimum quantity required daily for the renewal of the tissues of the body in a cow of 1,000 lb. live weight producing no milk.[2] The 1·75 lb. remaining for milk production we multiply by 300, the average number of days that a cow is in milk. We thus obtain 525 lb. of nitrogenous substance available for milk production. The produce of milk in the case of 115 herds, of which fuller details are given, was 6,250 lb. per cow, and of butter 301 lb. The milk, at 3·7 per cent. of albuminoids, would contain about 231 lb. There would thus be left 294 lb. of nitrogenous substance available for fat formation. The quantity of pure fat in the milk would be about 261 lb. We do not know exactly the quantity of fat which can be produced in the animal body from a given weight of albuminoids, but the heats of combustion of albumin, urea, and fat, show plainly that albuminoids can only yield less than half their weight of fat. We have then 147 lb. of fat as a figure which must exceed the highest possible production from the albuminoids of the food. Indeed, when we recollect the large proportion of amides which the 294 lb. of available nitrogenous substance would contain, we shall see that the actual fat formation from albuminoids must have been far below the maximum estimate just given. It is thus impossible to account for the average production of 261 lb. of milk fat by the cow on the assumption that the fat was all derived from the albuminoids of the food; we must assume that a large proportion of this fat was derived from the fat or carbo-hydrates. Which of these food constituents contributed most to the production of the milk fat the statistics fail to indicate.

The statistical method of viewing the question before us is one likely to carry conviction to the practical man, but it is of less value for scientific purposes, the facts on which the conclusions are based not being known with sufficient fulness or accuracy. We turn now to a later American experiment of a thoroughly scientific character.

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[1] By nitrogenous substance is understood the nitrogen of the food multiplied by 6·25. In the case of cereal grains this calculation gives very nearly the amount of albuminoids present. In the case of hay, and especially in the case of roots or silage, the number thus obtained is in excess of the true albuminoids present, a considerable proportion of the nitrogen in these foods being in the form of amides.

[2] The minimum daily supply of true albuminoids which has been observed to produce nitrogen equilibrium in an ox or a horse at rest is 0·4 lb. per 1,000 lb. live weight. This is the smallest deduction we can make. It is usual to take 0 7 lb. per 1,000 lb. live weight as a safe and sufficient quantity for a purely maintenance ration.

It is clear that we might distinguish between the action of the fat and of the carbo-hydrates of the food in the production of butter by supplying a cow with food in which fat was absent. If, under these conditions, the production of milk fat still greatly exceeded the quantity which the albuminoids supplied could furnish, we should have established the production of milk fat from carbohydrates. This experiment has been actually carried out in a most careful and thorough manner at the Experiment Station at Geneva, New York; the details have been lately published in their Bulletin, No. 132.

The experimenters, Messrs. Jordan and Jenter, most wisely chose a young and vigorous Jersey cow for this investigation. In order to diminish as far as may be the uncertainties of an experiment of this kind, it is necessary that the production of fat should be as large as possible in relation to the weight of the animal body, so that any changes in the composition of this body (which must remain to some extent unknown) may have the smallest possible effect on the result obtained. The small Jersey cow, producing milk very rich in fat, admirably fulfils these requirements. The weight of the cow selected was 867 lb. at the commencement of the strict period of experiment. The milk averaged over 5 per cent. of fat.

This cow was fed, during 95 days, on various rations made up of timothy hay, maize meal, and oats; some of the rations included a small quantity of wheat gluten. The whole of these foods had been previously extracted with a light benzol by the Cleveland Linseed Oil Company, and the greater part of the fat they contained had thus been removed. Most fortunately this treatment of the food did not affect the appetite or health of the cow.

The cow during the experiment stood in a stall, provided with an impervious metal floor, and was attended by a man day and night, who collected the urine and fæces separately in appropriate vessels. Nitrogen and fat were determined in daily samples of the food consumed. Nitrogen and fat were also daily determined in a mixed sample of the fæces. From these data the quantities of nitrogenous matter and fat digested by the cow, and passing into her circulation, were ascertained. The quantities of nitrogen and fat in the milk were also daily determined, and the quantity of nitrogen in the urine. The exact determinations of nitrogen were continued during a period of 59 days; the determinations of fat in food and milk extended over 95 days.

We shall obtain the clearest idea of the general results of the experiment if we disregard at first the variations made from

time to time in the cow's rations, and look simply at the total quantity of food consumed in 59 and 95 days respectively, and at the products it yielded in milk, urine, &c.

During the whole period of 95 days the cow received 11·6 lb. of fat in her food, of which 5·9 lb. appeared in the fæces as undigested; 5·7 lb. of fat was thus supplied by the food for the nutrition of the animal. The fat in the milk during this period amounted to 62·9 lb. The fat in the food was thus clearly not contributing to any practical extent to the production of milk. Not only, however, was there the large production of fat in the milk just noticed, there was besides a considerable increase in the body fat of the cow, the animal gaining 47 lb. in weight during the 95 days, while the nitrogen statistics showed no gain of nitrogenous tissue.

The statistics of the 59 days show that 19·88 lb. of nitrogen was received in the food during this period, while 9·95 lb. was found in the fæces, leaving nitrogenous matter containing 9·93 lb. of nitrogen for the nutrition of the animal. The digestibility of the nitrogenous matter in the food was certainly low, and the cow received, on an average, only a scant supply of albuminoids. The nitrogen in the milk amounted during the 59 days to 4·83 lb., and the nitrogen in the urine during the same period to 5·33 lb. The total quantity of nitrogen in the weighed products of the body was thus 0·23 lb. more than in the food received. To account for this excess of products over receipts, we must assume that the cow had lost about 1½ lb. of dry nitrogenous tissue during the 59 days; she gained, however, during the same period 31 lb. in body weight. The solid portion of this increase was doubtless fat.

The nitrogen found in the urine exactly represents the quantity of nitrogenous matter broken up in the body; if, therefore, albuminoids have been used for the production of fat, the quantity so used cannot possibly exceed that represented by the nitrogen in the urine. The 5·33 lb. of nitrogen found in the urine during the 59 days would represent at most 33·31 lb. of albuminoids broken up in the body. Taking, as before, one-half the weight of the albuminoids as a very liberal estimate of the proportion of fat which they are capable of yielding, we see that the quantity of fat formed from albuminoids during the 59 days could not possibly have exceeded 16·6 lb. The food supplied during the same time 3·3 lb. of digestible fat. The total quantity of fat derived from albuminoids, and from the fat of the food, could not thus have exceeded 19·9 lb. The milk, however, during the 59 days yielded 38·8 lb. of fat, and the cow had during this time increased 31 lb. in weight, and, to all appear-

ance, had become sensibly fatter. We are thus obliged to admit that at least half the fat in the milk, in addition to the fat stored up in the cow's body, had been derived not from the albuminoids and fat, but *from the carbo-hydrates of the food.*

The case is really a great deal stronger than we have just stated. We have taken no account of the fact that some of the nitrogenous substance in the hay would consist not of albuminoids but of amides. We have also not taken any notice of the consumption of albuminoids to replace the daily waste of bodily tissues. The albuminoids employed for the latter purpose during 59 days could not be less than 20·8 lb., and it seems very improbable that the waste nitrogenous matters broken up into urea in the general circulation should contribute a maximum amount of fat in the udder of the cow. Thus, taking all the facts into consideration, it becomes quite possible that none of the fat of the milk had been derived from the albuminoids of the food.

Even, however, if the albuminoids of the food are not themselves converted into fat, a fairly liberal supply of albuminoids is evidently favourable to the production of milk, and this fact appears in the Geneva experiments. The cow received for 29 days 1 lb. of wheat gluten daily in her food; then for seven days this quantity was raised to 1¼ lb., the other ingredients remaining unaltered. There followed a transition period of five days, in which the gluten was gradually removed and replaced by 1½ lb. of maize meal. This less nitrogenous diet was continued for eight days. The ratio of the digested albuminoids to the digested non-albuminoids in these three rations was approximately 1 : 7·8, 1 : 6·0, and 1 : 12·7. The quantities of nitrogenous substance daily received by the cow in these three periods, and the results yielded in milk, were the following:—

Albuminoids daily supplied, and Products obtained, in Three successive Periods.

Diet	Albuminoids digested	Weight of milk	Albuminoid in milk	Fat in milk
	lb.	lb.	lb.	lb.
Normal . .	1·42	15·3	0·62	0·74
Maximum albuminoids .	1·85	14·4	0·59	0·76
Minimum albuminoids .	0·90	11·9	0·49	0·65

As the cow advanced in lactation a gradual falling off in the quantity of the milk, and an improvement in its quality, was to be expected. No gain in the quantity or quality of the milk

appears in the figures just quoted from the considerable increase of albuminoids in the second diet, but a marked falling off in quantity is noticed when the last diet, very poor in albuminoids, is substituted. The yield of milk again rose to 13 lb. per day when a month later the cow received once more the normal diet. During the normal diet the animal gained a little in nitrogenous tissue, a part of the excess of albumin being stored up. During the middle diet this gain of nitrogen became very considerable. During the last diet the body parted with a little nitrogenous tissue, the food not supplying sufficient for the animal requirements.

The directors of the Geneva Experiment Station are to be heartily congratulated upon the bold and very successful experiment which they have carried out, the results of which are of far-reaching importance. The dairy farmer need no longer feel the necessity for supplying his cows at all costs with a highly nitrogenous diet; a liberal ration of cereal corn, including bran, is apparently sufficient to yield a full supply of milk and butter. There remain, however, many questions of practical economy to be settled, and the directors of local agricultural experiments cannot do better than study the effects of various diets on the production of milk and butter.

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THE ROYAL COMMISSION ON TUBERCULOSIS.

THE report[1] of the Royal Commission which was appointed in July 1896 to consider the question of tuberculous meat and milk in relation to human health, is a document of much interest and importance. To the general public it cannot fail to be of interest, inasmuch as it endeavours to estimate the degree of danger which arises from the wide prevalence of tubercular disease among cattle in a country where meat and milk may be termed staple articles of diet, and also suggests the measures which appear to be necessary and practicable in order to remove or minimise that danger. For agriculturists

[1] *Report of the Royal Commission appointed to inquire into the Administrative Procedures for controlling Danger to Man through the Use as Food of the Meat and Milk of Tuberculous Animals* [C.—8821]. Price 3*d*. London: Eyre & Spottiswoode.

and those engaged in the cattle and meat trades it has a superadded importance, inasmuch as it makes recommendations which may possibly in the near future serve as the basis of legislation affecting their material interests. The following pages are devoted to a discussion of the recommendations of the Royal Commissioners, and the grounds on which these are based. The actual text of the recommendations is reproduced at the end (p. 340).

The Danger from Meat.

That the comparatively common occurrence of tubercular disease among domestic animals slaughtered for food purposes involves some degree of risk to human beings has not for a moment been in doubt since Koch showed in 1882 that human and bovine tuberculosis are identical diseases; but, from the time when public opinion was first awakened to the danger, different estimates have been formed as to its real extent. For a number of years a very serious view of the matter was taken by many medical officers of health and other authorities on questions of public sanitation; and many persons who were not in a position from personal knowledge to weigh the evidence on which a conclusion one way or the other might be drawn were influenced by the finding of the Congress for the Study of Tuberculosis in Man and Animals. This Congress of medical men and veterinary surgeons met in Paris in 1888, and, as a result of its deliberations, came to the conclusion that, in the interests of public health, it was necessary to apply the principle of total seizure to the flesh of tuberculous animals—that is to say, to condemn as unfit for human food the entire carcass and all the organs of every tuberculous animal, no matter how slight the apparent evidence of disease might be. Even in France, however, a considerable number of eminent authorities dissented from this somewhat sensational recommendation, and in this country and in Germany such an extreme view of the danger of consuming the flesh of tuberculous animals never found general acceptance among pathologists.

The Departmental Committee which was appointed in 1888 to inquire into pleuro-pneumonia and tuberculosis considered the possible intercommunicability of the latter disease from animals to man and *vice versâ*; but their report did not express any opinion as to the extent of the danger in this connection, or as to the necessity of practising total condemnation of the carcasses of tuberculous animals.

In 1890 the first Royal Commission on tuberculosis [1] was

[1] See Journal R. A. S. E., 3rd series, vol. vi. (part ii.), 1895, p. 400.—Ed.

appointed "to inquire and report what is the effect, if any, of food derived from tuberculous animals on human health; and if prejudicial, what are the circumstances and conditions with regard to the tuberculosis in the animal which produce that effect upon man?" After nearly five years devoted to the collection of experimental and other evidence, the members of this Commission found themselves unable to express any definite opinion as to the proportion of tuberculosis acquired by man through his food; but they thought it probable that an appreciable part of the tuberculosis that affects man is obtained in that way. What was practically the most important outcome of their deliberations was contained in that part of their report which expressed the opinion that, "provided every part that is the seat of tuberculous matter be avoided and destroyed, and provided care be taken to save from contamination of such matter the actual meat substance of a tuberculous animal, a great deal of meat from animals affected by tuberculosis may be taken without risk to the consumer." This was obviously a declaration opposed to the principle of "total seizure;" and since it was subscribed to by three eminent members of the medical profession, it doubtless had considerable effect in counteracting the alarmist views previously enunciated by the French Congress.

It is satisfactory to know that in this matter the second Commission found itself in complete agreement with the first. The recently issued report, while endorsing the finding of the first Royal Commission, that "any person who takes tuberculous matter into the body as food incurs risk of acquiring tubercular disease," records the opinion that the risk to the human subject of acquiring tuberculosis through meat has been greatly over-estimated. The members of the second Commission could find no evidence of it in the mortality returns dealing with the period of life during which meat has for years past been consumed in increasing quantity in this country; and the only evidence in the opposite direction with which they were acquainted—namely, the results of certain artificially contrived infections of meat made at the instance of the previous Commission—was the outcome of deliberately contrived laboratory experiments, admittedly carried out under methods involving a risk greater than any that would arise in ordinary trade procedures. In their opinion a certain degree of danger exists; but at certain places an exaggerated estimate of it has been formed and acted upon, with the result that "a great deal of meat is seized which is perfectly safe and wholesome food." The evidence taken by the Commission showed that the widest discrepancy prevails at the present time as to the amount and

distribution of tubercular disease which is supposed to justify the seizure and condemnation of a carcass as unfit for food; and in the opinion of the Commission the time has arrived when it is both desirable and possible to substitute for the present chaotic system, or absence of system, in the inspection and seizure of tuberculous meat, a definite series of regulations for the guidance of meat inspectors. They have accordingly included in their report a recommendation on this subject, which is much on the same lines as the resolutions passed at the International Veterinary Congress held at Berne in 1896, and which is also in close agreement with the official regulations now in force in France and Germany. It is hardly possible to doubt that, whether this recommendation be soon embodied in legislation or not, it will have the effect of putting a stop to the wanton destruction of otherwise good carcasses on the ground that a few insignificant tuberculous lesions have been discovered in some of the internal organs or lymphatic glands.

The recommendations with regard to this point practically amount to a declaration in favour of passing the flesh of any well-nourished tuberculous animal, unless the disease is generalised, or has visible lesions in the edible portions of the carcass; and the importance of this becomes manifest when it is remembered that, while probably over 30 per cent. of the adult cattle in this country are tuberculous in some degree, and would therefore merit condemnation on the principle of "total seizure," it may safely be estimated that under the system recommended by the Royal Commission the carcasses of over 90 per cent. of the tuberculous animals would be passed as fit for food. Justification for this estimate is found in the statistics with regard to tuberculosis for the kingdom of Saxony for the year 1895, which are quoted in the report of the Royal Commission. These figures relate to the twenty-nine towns in Saxony in which there is a rigid but discriminating inspection of all the cattle slaughtered, the carcasses being passed or condemned according to the situation and extent of the tubercular lesions, in conformity with a regulation very similar to the recommendation on this head included in the report of the Royal Commission. In the year mentioned tubercular disease was detected in 22,753 animals, being 27·48 per cent. of the total cattle slaughtered. According to the practice advocated by some persons in this country, the entire carcasses of all those animals would have been confiscated; but in Saxony 92½ per cent. of them were passed as wholesome, and 2 per cent. were condemned as totally unfit for food, while the remainder (about

5½ per cent.) were disposed of in the cooked condition, at a low price, and with a declaration of the source of the meat. There is no reason to suppose that the proportion of cases of advanced and generalised tuberculosis is any higher in Great Britain than in Saxony; and it is satisfactory to know that, under a system of meat inspection which is considered by the most eminent authorities sufficiently rigorous to safeguard the public health, not much more than one tuberculous carcass in twenty would require to be condemned.

It is not unlikely that in those localities in this country in which a method verging on total seizure in every case of tuberculosis has been in vogue, pressure may be required to bring into use more moderate practices; but, with the authority of a Royal Commission behind them, butchers should have little difficulty in preventing the destruction of the carcasses of animals that were perfectly healthy save for the presence of a few inconsiderable tubercular lesions in some of the internal organs.

Slaughter-house Reform.

It is obvious that, if an unrestricted traffic in the flesh of tuberculous animals involves a risk to human health which public authorities cannot afford to ignore, it matters little whether a system of total or partial seizure is officially declared to be sufficient so long as the bulk of the meat consumed in this country is not inspected at all. The members of the Royal Commission have therefore put in the forefront of their recommendations one in favour of the abolition of private slaughter-houses (the existence of which is incompatible with the carrying out of a proper system of meat inspection) and the erection of public ones, to which there should be attached duly qualified officers for the inspection of all animals killed in them. The Commissioners believe "that the use of public slaughter-houses in populous places, to the exclusion of all private ones, is a necessary preliminary to a uniform and equitable system of meat inspection," and they consider that power should be given to every local authority expending money in providing a public slaughter-house to close, if they think fit, all or any of the registered slaughter-houses in the district. This power is already possessed by burghs in Scotland under the Burgh Police Act of 1892, and at the present time in Edinburgh and Glasgow no private slaughter-houses are permitted within the municipal boundaries. In England and Wales urban authorities "may, if they think fit, provide slaughter-houses;" but no power is given to a sanitary authority

to close private slaughter-houses on the erection of a public one, though it may close a private licensed slaughter-house when the occupier has been twice convicted for non-compliance with the bye-laws, or for having sold unsound or diseased meat on the premises. A still greater obstacle, however, to the proper regulation of the meat traffic in England and Wales lies in the "registered" slaughter-houses—namely, those which were in existence at the time of application to the town or district of the Towns Improvement Clauses Act of 1897. Such slaughter-houses cannot be closed unless two convictions have been obtained against the owner or proprietor; and since the occupier is seldom the owner it follows that, in spite of repeated convictions of the occupier, the premises cannot be closed. Some notion of the difficulty which is hereby created may be formed when it is stated that in Brighton there are no fewer than forty-five registered slaughter-houses (the total number in the town), and that not one of these is tenanted by the proprietor.

Evidence laid before the Commissioners showed that, even when the power to erect public slaughter-houses and abolish private ones is possessed and exercised, the efforts of the local authority to control the traffic in meat may be defeated. Notable examples of this are furnished by Belfast and Dublin. In the first of these there is a very convenient public slaughter-house; but many of the butchers, in order to escape inspection, have erected private slaughter-houses outside the city boundary. Dublin possesses a public slaughter-house which was erected by the corporation at a cost of 20,000*l.*; but the great majority of the animals are killed in the seventy-six private slaughter-houses within the city, where there is practically no inspection of the carcasses. To remedy this defect in the law the Commission recommend that, in every district in which a public slaughter-house has been erected, every slaughtered carcass brought into the district should be submitted to inspection, unless it bears sufficient evidence of having been inspected and passed in the public slaughter-house of another authority. It is further recommended that foreign meat should be required to bear a mark of inspection and approval at the time of killing, and that steps should be taken, through consular and other agencies, to ascertain from time to time that there is an efficient inspection at foreign slaughter-houses of meat intended for transmission to this country.

It is obvious that all these suggestions for the reform of meat inspection in this country are only of secondary interest to agriculturists; and it may confidently be expected that any attempt

to embody them in legislation will meet with some opposition from butchers, whose interests they would chiefly affect.

The Danger from Milk.

Although, as already indicated, a less serious view of the danger arising to human beings through tuberculous meat than was at one time widely entertained appears to be justified, the same cannot be said of the dangers associated with the consumption of milk from tuberculous cows. With reference to the former point the report of the Royal Commission is comparatively reassuring; but it is clear that the evidence laid before them compelled them to take a serious view of the dangers which now exist of tuberculosis being conveyed to human beings by means of milk. It is true that no evidence was placed before the Commission to prove that this danger exists unless the udder is itself the seat of tubercular disease; but, considering that the disease is specially prevalent among dairy stock, that cases in which the udder is involved are not altogether rare, and that the existing laws in this country do not give sanitary authorities the power to prevent the sale of milk from an undoubtedly tuberculous udder, it is impossible to deny that there is cause for uneasiness. In both England and Scotland the main provisions of the law with regard to the regulation of the traffic in milk are contained in the Dairies, Cowsheds, and Milkshops Order, 1895; but unfortunately at that date the dangers of tuberculous milk had not been sufficiently apprehended. Hence, although the Order contains sections which would appear to be sufficient to protect the public against milk-borne disease of human origin, such as scarlatina or diphtheria, it confers no powers with regard to tuberculosis. It directs that, "if at any time disease exists among the cattle in a dairy, or cowshed, or other building or place, the milk of a diseased cow therein shall not be mixed with other milk, and shall not be sold or used for human food." But, unfortunately for the safeguarding of the public from the danger of tuberculous milk, the word "disease" in the Order is strictly limited to those diseases included under the Contagious Diseases (Animals) Act, 1878, of which tuberculosis is not one. It has been suggested that the Local Government Board, which administers the Order, should extend the term so as to include tuberculosis; but, notwithstanding representations from various bodies recommending this, the Commissioners consider that the change ought to be effected without any alteration in the nomenclature of the Diseases of Animals Act, since that Act is concerned solely with the spread of disease from animal to animal, and not from animal to man.

The Commissioners are further of opinion that the Order should be made applicable to all diseases of the udder in cows of which the milk is offered for sale, since tuberculosis of the udder can rarely be differentiated from other forms of udder disease by the ordinary stock-owner or dairyman.

The Infectious Diseases (Prevention) Act, 1890, section 4, confers powers to stop the sale of milk when "the medical officer of health is in possession of evidence that any person in the district is suffering from infectious disease attributable to milk supplied within the district from any dairy situate within or without the district, or that the consumption of milk from such a dairy is likely to cause infectious disease to any person residing in the district." It might have been supposed that the powers conferred by this section of the Act would have gone a considerable way to avert the danger associated with the existence of tubercular disease in the udder of a milch cow; but the report of the Commission states that in practice it has been found to be quite inapplicable to the purposes of tuberculosis or of udder disease generally in the milch cow.

It is quite obvious that permissive powers, even if quite sufficient for the elimination of cases of udder tuberculosis, and duly exercised in any city in the kingdom, would not afford its inhabitants adequate security, since all the populous centres draw the bulk of their milk supply from outside sources. Nothing but the general exercise of measures directed against the danger will suffice to protect the milk-consuming public, and the Commissioners are of opinion that there is "the most urgent necessity for powers being conferred on, and exercised by, local authorities to make periodical inspections of all cows of which the milk is offered for sale within their districts." Such inspection, they consider, would be best made by veterinary surgeons; but, presumably on the ground of expense, they hesitate to propose the employment of inspectors of this class at all stages of the necessary inspections. The plan which the Commissioners apparently had in view would consist in the employment of lay inspectors, without a veterinary training or qualification, to make periodical examinations of milch cows, with a view to the detection of udder disease, but without authority to stop the sale of the milk, which power would be reserved to the medical officer of health.

In this connection it is worth while to recall the opinion formed regarding the dangers of tuberculous milk by the previous Royal Commission. The report of that Commission expressed the view that "the condition required for ensuring to the milk of tuberculous cows the ability to produce tuberculosis in the

consumers of their milk is *tubercular disease of the cow affecting the udder.*" [1]

"The withdrawal from dairies of every cow that had any disease whatever of her udder would form some approach to security against serious danger incurred by man from the use of tuberculous milk; but it would not be an adequate security. The presence in a dairy of a tuberculous cow, as Drs. Martin and Woodhead have shown, is a decided source of danger to the public, especially having regard to what we have learnt respecting the rapid development of tuberculosis in the udder, and the degree of danger to milk consumers incurred by the invasion of the udder in tuberculous cows."

The paragraphs quoted may fairly be held to mean that the members of the first Commission were of opinion that the sale of milk from a cow known to be tuberculous in any part of the body, and to any degree, ought not to be permitted. The members of the more recent Commission concur generally in the views expressed in the paragraphs above quoted; but, having regard to the extent to which tuberculosis exists among milch cows, and to the absence of evidence that danger of conveying tuberculosis arises from the use of milk as a food, apart from the existence of tubercular disease of the udder, they are of opinion that direct action for the elimination of all tuberculous cows from dairies should proceed tentatively. The directions in which they consider immediate action to be necessary are:—

1. Compulsory notification of every disease of the udder of cows, whether in private dairies or in those that furnish milk to the public.
2. Systematic inspection of the cows in dairies and cow-sheds.
3. Power for a medical officer to suspend the supply of milk from any suspected cow for a period not exceeding 48 hours, pending veterinary inspection.
4. Power to prohibit the sale of milk from any cow certified by a veterinary surgeon to be suffering from such disease of the udder as in his opinion renders the animal unfit for the supply of milk, or exhibiting clinical symptoms of tuberculosis.
5. The provision of a penalty for supplying milk for sale from any cow having obvious udder disease, without the possession, by the owner, of a certificate to the effect that such disease is not tubercular.

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[1] The italics are in the original.

It is not unlikely that the measures fore-shadowed in these recommendations will be considered more than sufficiently drastic by many farmers and dairymen; but it will be observed that they fall a good deal short of what the first Commission regarded as necessary to provide "adequate security" to milk consumers. Indeed, it is almost certain that they will not be considered sufficient by medical authorities. In view of the fact that probably from 30 to 40 per cent. of the milch cows in this country are tuberculous, one cannot blame the Commissioners for declining to recommend the immediate prohibition of the sale of milk from every one that is tuberculous; but many will consider that the time has now arrived when the notification of symptoms of tuberculosis in milch cows should be made compulsory, and when the sale of milk from cows presenting clinical symptoms of the disease should be prohibited under penalty until a veterinary surgeon has certified that the disease is not tuberculosis. The introduction of such a regulation may be contended for not only on the ground that it is a reasonable precaution against the communication of disease to the milk consumer, but also because it is eminently desirable in the interests of the owner himself that an animal clinically tuberculous should be removed from the herd. A cow that is showing distinct symptoms of tuberculosis is generally a fertile source of infection to other animals in the herd, and it is much more likely to develop udder tuberculosis than one in which the disease can only be detected by the aid of tuberculin. The Commissioners themselves say that they "have received the impression that public opinion is prepared to endorse measures taken to secure an uncontaminated milk supply," and it is very probable that public opinion will not be satisfied while the law allows a man to sell the milk of a cow presenting symptoms of tuberculosis. It is true that the Commissioners, in the body of their report, recommend that power should be given to a medical officer of health to prohibit the sale of milk from any cow certified by a veterinary surgeon to be exhibiting clinical symptoms of tuberculosis, and the Commissioners probably were of opinion that this power, coupled with systematic inspection, would be a reasonable safeguard. It can hardly be doubted, however, that these precautions would be greatly strengthened if notification of symptoms of tuberculosis in a milch cow were made compulsory under a penalty for not reporting.

Elimination of Tuberculosis.

In the opinion of the Commissioners, by far the most important part of the inquiry committed to them, as to "what

administrative procedures are available and would be desirable for controlling the danger to man through the use as food of the meat and milk of tuberculous animals," lay in the direction of eliminating the disease, and that part of the subject received their most careful consideration.

The Departmental Committee of 1888 also considered this question, and they were of opinion that a very considerable reduction of the disease would probably be effected if it were included in the Contagious Diseases (Animals) Act, so as to provide for the seizure and slaughter (with compensation) of visibly diseased animals. Owing to the difficulty of diagnosing the disease in its early stages, they did not recommend compulsory notification; but strange to say, they did not recognise what an insuperable obstacle this placed in the way of measures of eradication. This point, however, did not escape the notice of the Privy Council, and it was one of the main reasons why effect was not given to the recommendations of the Departmental Committee.

The discovery of the valuable diagnostic properties of tuberculin appeared at first to remove this ground for inaction; but the experience gained during the last few years by the use of tuberculin has brought to light a still greater obstacle to a stamping-out policy—namely, the discovery that an enormous number of the cattle in this country are affected with the disease. There seems little reason to doubt that from 30 to 40 per cent. of the breeding stock are tuberculous in some degree; and in these circumstances to attempt to deal with the disease on the lines followed in the case of pleuro-pneumonia is out of the question on the score of cost. This is the opinion arrived at by the members of the Royal Commission, and their report endorses the view laid before them by the representatives of the Committee of the Central and Associated Chambers of Agriculture, that such a scheme is impracticable. Fortunately the Commission had for their guidance in this matter the experience of Belgium. In that country a drastic scheme, which aimed at the rapid extermination of bovine tuberculosis, came into force in the latter part of 1895. It ordained the compulsory notification of tuberculosis, whether discovered during life or *post mortem*, and provided that when a case was discovered it was to be traced back to the premises from which it came. Other animals that had been in association with the diseased one (occupying the same building) were forbidden to be sold except for slaughter, unless they were proved non-tuberculous by the tuberculin test; and the immediate slaughter of clinically tuberculous animals might be demanded

from the local authority on the certificate of a qualified veterinary surgeon. If the owner signified his consent to the use of tuberculin, the test would be carried out by a qualified veterinary surgeon at the expense of the Government, and only animals intended for immediate slaughter could be exempted. After the test the owner was required to immediately remove the reacting and non-reacting animals to separate buildings, or, failing that, to separate them within ten days by a partition adequate to prevent infection through it. The owner was also required to submit his animals afterwards, at least once a year, and at Government expense, to the tuberculin test, and to introduce no animals among his healthy stock until he had, at his own expense, ascertained them to be non-tuberculous by the tuberculin test. These and other restrictions of a minor character were to be maintained until the disappearance of the last case of the disease. Cattle that had reacted could not be sold unless for slaughter, which, except in special cases, had to be carried out within one year. Finally, the scheme was combined with a fairly liberal scale of compensation for carcasses condemned on account of tuberculosis; but no compensation was given unless the regulations above sketched had been complied with.

When certain members of the Royal Commission visited Belgium in order to inquire into the working of this scheme, they found that after a year's experience the Government had resolved to withdraw it, and to substitute for it a new regulation which makes no pretence to be a stamping-out measure, since, although it makes notification compulsory, and ordains the slaughter of animals clinically tuberculous, the testing of animals that have been in contact is left to the option of the owner.

The abandonment of the more drastic scheme became necessary on account of the great number of animals found to be affected, and the consequent intolerable cost. The scheme had been in operation for about a year when the members of the Commission visited Belgium, and during that period 22,000 animals were tested, of which no less than 63·7 per cent. reacted. It is hardly conceivable that anyone will blame the Commissioners for pronouncing any scheme on these lines quite impracticable for this country.

The only plan yet proposed for dealing with bovine tuberculosis which commended itself to the members of the Royal Commission is that which is now generally known in this country as the Danish method. This method was carefully studied and favourably reported upon by those members of the Commission who visited

Denmark in the spring of 1897. It is the outcome of certain experiments which were carried out for the Danish Government by Professor Bang, of the Copenhagen Veterinary College, and it is based upon the value of tuberculin as a means of diagnosis, and the possibility of economically and gradually eliminating the disease from a herd by effecting a separation between those members of it that react to tuberculin and those that do not react. It differs from the abandoned Belgian plan in that it is purely voluntary. The State encourages the adoption of the method by furnishing, free of charge, the tuberculin and the services of the veterinary surgeon employed in carrying out the test, on condition that the owner undertakes to permanently isolate the animals that react, and take other minor precautions to prevent infection of his healthy animals. At the date of the Commissioners' visit to Denmark, nearly 150,000 cattle had been tested under this plan, with results that were considered very satisfactory by the owners and the authorities. The success of the method is absolutely dependent on the reliability of the tuberculin test, and it is satisfactory to note that the Commissioners "entertain no doubt as to the value of tuberculin, provided the test is applied by a competent veterinary surgeon, and that the tuberculin is of trustworthy quality." Evidence laid before them satisfactorily explained the discrepancy between this verdict and the less flattering terms in which the tuberculin test was referred to in the report of the previous Commission. Many of the experiments made with tuberculin for the first Commission had to be carried out on cattle condemned under the Pleuro-pneumonia Slaughter Order, and kept during the test in sheds attached to slaughter-houses. Later experience has confirmed the results obtained in these circumstances, and has shown that, while the test is one of extreme accuracy in the case of animals standing undisturbed in their own premises, it is not reliable when applied to animals exposed in a market, or which have recently been trained, shipped, or otherwise exposed to conditions calculated to excite them and disturb their temperature.

The Danish method has sometimes been strongly condemned because it does not prohibit breeding from tuberculous animals, the objection implying that the disease is very likely to be inherited from the tuberculous parent. For some years this opinion has been quite untenable, since careful observation has shown that the progeny of tuberculous cows are rarely born tuberculous. Now that this ground of objection has been removed, another has been sought in the alleged tendency of tuberculous animals to transmit to their progeny a peculiar susceptibility to the disease. This

would be a sufficient reason for refusing to breed from a tuberculous animal, if being affected with the disease always implied a special susceptibility, and freedom from it a high degree of insusceptibility. But, of course, that is not the case, since whether an animal escapes or becomes diseased may depend upon varying degrees of exposure to infection. Some of the witnesses before the Commission strongly deprecated the practice of breeding from a cow found to be tuberculous, apparently forgetful that, in the meantime, there is no alternative to that, save the sacrifice of from 30 to 40 per cent. of the breeding cattle in this country. With reference to this matter the report of the Royal Commission quotes the experience of a slaughter-house in Jutland, where congenital tuberculosis was detected in between three and four calves per 1,000 examined—a proportion so very small that in the opinion of the Commissioners it might be disregarded. In their view the main risk of breeding from a tuberculous cow is the danger of infection after birth, unless the calf is immediately separated, and the cow's milk boiled before it is given to the calf.

Believing that the present insanitary conditions of many cowsheds constitute highly favourable conditions for the spread of tuberculous infection among the animals kept in them, the Commissioners advocate a more rigorous inspection of cowsheds and byres, and in the recommendations at the end of their report they specify the conditions which ought, in their opinion, to be insisted upon in the future in the case of such premises. These include a minimum cubic capacity of 600 feet for each beast; but this applies only to cowsheds in populous places. In sparsely populated places it is recommended that the cubic space should be sufficient to permit reasonable ventilation without draught; but, owing to the physical circumstances prevailing in different localities being so various, they did not find it practicable to prescribe uniform minimum requirements in this respect. The distinction which is here drawn between town and country byres appears to be fully justified when it is remembered that, throughout the greater part of the year in the country, cows spend a considerable part of the twenty-four hours in the open air, whereas the inhabitants of the town byre are almost invariably closely confined to the building. The Commissioners consider that the keeping of dairy stock in crowded streets is open to such serious objections as to render it advisable to prohibit in populous places any cowshed not already registered.

That the suggested improvements in the construction of

cowsheds would be favourable to the general health of the cows kept in them, and conducive to the exercise of cleanliness in working with the milk, is hardly open to doubt; but it would be a great mistake to attach much importance to them as means by which tuberculosis may be eliminated from among dairy stock. It cannot be too strongly insisted upon that a cubic capacity of 1,200 cubic feet per cow will not prevent the spread of tuberculous disease in a byre, and that perfect freedom from tuberculosis is quite possible in a byre with less than half that cubic capacity per animal.

Compensation.

The Commissioners were unanimously of opinion that when the sale of milk is prohibited in consequence of udder disease or clinical symptoms of tuberculous disease on the part of the animal furnishing the milk, no claim for compensation ought to be allowed; but should the local authority require the animal to be slaughtered, and the *post-mortem* examination show that a mistake in diagnosis had been made, the owner should receive in compensation the full value of the cow immediately before slaughter. If, on the other hand, the *post-mortem* should confirm the diagnosis, the carcass should be sold by the local authority, and the proceeds handed over to the owner. It ought to be remembered that slaughter is recommended only when the cow is suffering from tuberculosis of the udder, or is in an advanced stage of the disease; and the Commissioners adopt the view that none but an unscrupulous cowkeeper would knowingly allow milk from such a source to be mixed for sale with the milk of his other cows.

The only matter arising out of the terms of their reference on which the Commissioners could not come to a unanimous decision was the question of compensation to owners of condemned carcasses. Four of the Commissioners arrived at the conclusion that on the merits of the case compensation ought not to be recommended, and the remaining three Commissioners dissented from this opinion. The grounds on which the opinion adverse to compensation was founded were (1) that the risk of seizure and condemnation on account of tuberculosis is one that is fully recognised in the trade, and necessarily affects the price paid for the living animal; (2) that even in the past the loss thrown on butchers has not been so great as has often been represented; (3) that the loss will be smaller in the future if effect be given to the recommendations made by the Commission with regard to the extent of the disease justifying seizure; and (4) that evidence laid before the Commission had convinced

them that the losses incurred by seizure can best be met by the system of mutual insurance.

A perusal of the evidence contained in the appendices to the report shows that, at least with regard to some of these objections to compensation, the attitude taken up by the majority of the Commissioners is fully justified. Notwithstanding numerous requests to be supplied with evidence as to actual cases of substantial loss through seizure of tuberculous carcasses, nearly all the witnesses who came before the Commission could only tell of one, two, or three such seizures during long periods of business, involving sales of hundreds and even thousands of carcasses. The exceptional cases were a few in which a stringency in the conditions deemed to justify seizure which the Commissioners considered to be unnecessary in the interests of public health had been observed by medical officers of health and other local officers; and it was generally admitted by these officials that they would be quite willing in the future to abide by any authoritative regulations laid down as to this. There is therefore good reason to suppose that in future seizures will be limited to the comparatively small proportion of cases in which the condemnation of the entire carcass is really necessary in the interests of public health. In their visit to the Continent the Commissioners ascertained that, by the method of mutual insurance, this source of loss to farmers and butchers has in many places been satisfactorily dealt with; and evidence was laid before the Commission showing that the matter had been successfully dealt with on the same lines in one or two towns in this country. And it is worthy of note that in Paisley, for example, where, in the opinion of the butchers, the system of inspection and condemnation is exceptionally and unnecessarily severe, a premium of 3*d*. per head for bullocks and 6*d*. per head for cows was found to be sufficient to cover the loss incurred by the members of the Society (67 in number) through condemnation of tuberculous carcasses.

The Commissioners who are in favour of compensation for condemned carcasses admit that it cannot be claimed on the ground of any analogy with the compensation which is granted under the Diseases of Animals Act, since in the case of meat seized there has neither been notification nor compulsory slaughter. The owner of the animal is simply found to be the unfortunate possessor of that which is not fit for human food; and to demand that he shall be compensated because he is not allowed to sell this dangerous food appears to raise a principle that has never yet been recognised in such matters. The chance of an apparently healthy animal turning out to be extensively

tuberculous ought to be recognised as an ordinary trade risk; but in the view of the minority of the Commissioners a claim for exceptional dealing with such cases is created by the fact that the butcher is absolutely irresponsible for the condition that entails condemnation, and because it does not appear to be possible to bring the loss directly home to the farmer or grazier. It is interesting to note that in Germany and France the loss is recoverable from the farmer; but, even if desirable, that plan would not be workable in the conditions under which the cattle trade is conducted in this country. The minority report suggests that the amount of compensation to be paid for a single carcass should be subject to a maximum and minimum price, that no compensation should be given unless the animal in life was in good condition and free from any sign of tuberculosis, and that the principle of compensation should only be carried out for a limited period. It is held that by the adoption of suitable measures the disease may soon be greatly reduced or entirely eliminated, and "the necessity for compensation will cease when it is in the power of each man to protect himself against serious loss. Scientific knowledge of the character of the disease is so recent that the ordinary agriculturist cannot be blamed for its prevalence in his stock. It seems, therefore, equitable to protect him against being made the scapegoat of the general ignorance which prevailed till recent years. But as soon as the proper treatment and precautions have been formulated, it will become his duty, as well as his interest, to put himself beyond risk of loss by confiscation. The butcher will then be able to protect himself by purchasing those animals only which have stood the recognised test."

Finally, the Commissioners who favour compensation think that one-half should be charged on the rates, and one-half contributed from Imperial funds; and the opinion is expressed that, with a more discriminating and uniform standard of inspection, the compensation to be paid for meat seized on account of tuberculosis would amount to a very trifling sum in each year.

Assuming that the evidence laid before the Commission by the representatives of the butchers' interests does not understate the amount of loss entailed in the past by confiscation of tuberculous carcasses, it is hardly possible to resist the conclusion that, so far as regards the magnitude of the sum involved, the matter is hardly worth fighting about. A great deal of the irritation and dissatisfaction excited among butchers by condemnation of tuberculous carcasses in the past has probably arisen from a feeling that much of the confiscated meat was perfectly safe for

human consumption; and some of the representatives of the trade emphatically declared that they did not desire or expect compensation for meat that was actually unwholesome. If effect be given to the recommendations of the Royal Commission with regard to the rules to be observed in judging of the fitness or unfitness of the carcasses of tuberculous animals in the future, nothing will be condemned that could with safety be used for the food of man, and the claim for compensation in these circumstances does not appear to be very well founded. At any rate, before it is conceded it will be well to remember that the slaughter-house discloses many other conditions besides tuberculosis which render flesh unfit for food, and that if the principle is admitted with regard to tuberculosis it will be difficult to prevent its extension.

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RECOMMENDATIONS OF THE ROYAL COMMISSIONERS.

MEAT.

A.—Slaughter-houses.

1. We recommend that in all towns and municipal boroughs in England and Wales, and in Ireland, powers be conferred on the authorities similar to those conferred on Scottish corporations and municipalities by the Burgh Police (Scotland) Act 1892, viz. :—

(*a*) When the local authority in any town or urban district in England and Wales and Ireland have provided a public slaughter-house, power be conferred on them to declare that no other place within the town or borough shall be used for slaughtering, except that a period of *three* years be allowed to the owners of existing registered private slaughter-houses to apply their premises to other purposes. The term of *three* years to date, in those places where adequate public slaughter-houses already exist, from the public announcement by the local authority that the use of such public slaughter-houses is obligatory, or, in those places where public slaughter-houses have not been erected, from the public announcement by the local authority that tenders for their erection have been accepted.

(*b*) That local authorities be empowered to require all meat slaughtered elsewhere than in a public slaughter-house, and brought into the district for sale, to be taken to a place or places where such meat may be inspected; and that local authorities be empowered to make a charge to cover the reasonable expenses attendant on such inspection.

(*c*) That when a public slaughter-house has been established inspectors shall be engaged to inspect all animals immediately after slaughter, and stamp the joints of all carcasses passed as sound.

2. It appears desirable that in London the provision of public in substitution for private slaughter-houses should be considered in respect to the needs of London as a whole, and in determining their positions regard must be had for the convenient conveyance of animals by railway from the markets beyond the limits of London, as well as from the Islington market, to the public slaughter-houses which should be provided. At the present time no administrative authority has statutory power authorising it to provide public slaughter-houses other than for the slaughter of foreign cattle at the port of debarkation.

3. With regard to slaughter-houses in rural districts, the case is not so easy to deal with. But the difficulty is one that must be faced, otherwise there will be a dangerous tendency to send unwholesome animals to be slaughtered and sold in small villages where they will escape inspection. We recommend, therefore, that in Great Britain the inspection of meat in rural districts be administered by the county councils. In Ireland the duty of carrying out inspection ought to devolve upon authorities corresponding as nearly as possible to those charged with that duty in England and Scotland. In view of the announced intention of the Government to introduce a new scheme of local government into Ireland we refrain from specifying the exact machinery which should be employed.

4. We recommend further that it shall not be lawful to offer for sale the meat of any animal which has not been killed in a duly licensed slaughter-house.

B.—Qualifications of Meat Inspectors.

5. We recommend that in future no person be permitted to act as a meat inspector until he has passed a qualifying examination, before such authority as may be prescribed by the Local Government Board (or Board of Agriculture), on the following subjects:—

(*a*) The law of meat inspection, and such bye-laws, regulations, &c., as may be in force at the time he presents himself for examination.

(*b*) The names and situations of the organs of the body.

(*c*) Signs of health and disease in animals destined for food, both when alive and after slaughter.

(*d*) The appearance and character of fresh meat, organs, fat, and blood, and the conditions rendering them, or preparations from them, fit or unfit for human food.

C.—Tuberculosis in Animals Intended for Food.

6. We recommend that the Local Government Board be empowered to issue instructions from time to time for the guidance of meat inspectors, prescribing the degree of tubercular disease which, in

the opinion of the Board, should cause a carcass, or part thereof, to be seized.

Pending the issue of such instructions we are of opinion that the following principles should be observed in the inspection of tuberculous carcasses of cattle :—

(*a*) When there is miliary tuberculosis of both lungs	The entire carcass and all the organs may be seized.
(*b*) When tuberculous lesions are present on the pleura and peritoneum . . .	
(*c*) When tuberculous lesions are present in the muscular system, or in the lymphatic glands embedded in or between the muscles .	
(*d*) When tuberculous lesions exist in any part of an emaciated carcass	

(*a*) When the lesions are confined to the lungs and the thoracic lymphatic glands . .	The carcass, if otherwise healthy, shall not be condemned, but every part of it containing tuberculous lesions shall be seized.
(*b*) When the lesions are confined to the liver .	
(*c*) When the lesions are confined to the pharyngeal lymphatic glands . . .	
(*d*) When the lesions are confined to any combination of the foregoing, but are collectively small in extent	

In view of the greater tendency to generalisation of tuberculosis in the pig, we consider that the presence of tubercular deposit in any degree should involve seizure of the whole carcass and of the organs.

In respect of foreign dead meat, seizure shall ensue in every case where the pleura have been "stripped."

MILK.

D.—Diseases in the Udders of Cows.

7. We recommend that notification of every disease in the udder shall be made compulsory, under penalty, on the owners of all cows, whether in private dairies or those of which the milk is offered for sale.

8. We recommend that for the purpose of excluding from their districts the milk of cows affected with tuberculosis of the udder, or exhibiting clinical symptoms of the disease, local authorities should be given powers somewhat similar to those of Sections 24–27 of the Glasgow Police (Amendment) Act, with power to slaughter such cows, subject to compensation under the conditions named in the report.

9. We also recommend that powers shall be given to local authorities to take samples and make analyses from time to time of the milk produced or sold in their districts, and that milk vendors shall be required to supply sufficient information as to the sources from which their milk is derived.

At ports where milk and milk products are received from foreign countries, any costs that may be thus incurred in their examination shall be borne by the importers.

E.—Cowsheds, Byres, &c.

10. We recommend that the Local Government Board be empowered to require local authorities to adopt regulations as to dairies, cowsheds, &c., where that shall be found not to have been done already.

11. That in future no cowshed, byre, or shippon, other than those already registered, shall be permitted or registered in urban districts within 100 feet of any dwelling house; and that the discontinuance of any one already existing shall be ordered on the certificate, either of the medical officer of health that it is injurious to the health of human beings residing near it, or of the veterinary inspector that it is not a place wherein cows ought to be kept for the purpose of milk supply, and that it is incapable of being made so.

12. That the conditions of the attached cowsheds that shall warrant the registering of a dairy in a populous place, whether technically urban or rural, in the future shall include the following:—

1. An impervious floor.
2. A sufficient water supply for flushing.
3. Proper drainage.
4. A depôt for the manure at a sufficient distance from the byres.
5. A minimum cubic contents as regards such districts of from 600 to 800 feet for each adult beast, varying according to the average weight of the animals.
6. A minimum floor space of 50 feet to each adult beast.
7. Sufficient light and ventilation.

While we have prescribed a minimum cubic contents and floor space without mentioning definite dimensions affecting ventilation and lighting, we are distinctly of opinion that these are by far the most important, and that requirements as to cubic and floor space are mainly of value as tending to facilitate adequate movement of air.

Existing cowsheds should be obliged to conform to the prescribed regulations within a period of twelve months from the time of the regulations coming into force.

13. The same conditions as those recommended for populous places should apply to cowsheds in sparsely populated places, except in so far as cubic contents per cow are concerned; as regards these cubic contents, such space per cow should be provided as would, in view of the surrounding circumstances, secure reasonable ventilation without draught. But the physical circumstances prevailing in different localities being so various, we do not find it practicable to prescribe uniform minimum requirements in this respect.

14. We recommend that where cows housed in one district supply milk to another district, the local authority of the district in which the cows are housed shall be bound, when required, to supply to the local authority of the district in which the milk is sold or consumed full information and veterinary reports re-

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garding the condition of the cows, byres, &c., whence the milk is drawn. Where the local authority of one district are dissatisfied with the reports so obtained, they may apply to the Local Government Board, with a view to an independent inspection and report being made.

F.—Elimination of Bovine Tuberculosis.

15. We recommend that funds be placed at the disposal of the Board of Agriculture in England and Scotland, and of the Veterinary Department of the Privy Council in Ireland, for the preparation of commercial tuberculin, and that stockowners be encouraged to test their animals by the offer of a gratuitous supply of tuberculin and the gratuitous services of a veterinary surgeon on certain conditions.

These conditions shall be—

(*a*) That the test be applied by a veterinary surgeon.

(*b*) That tuberculin be supplied only to such owners as will undertake to isolate reacting animals from healthy ones.

(*c*) That the stock to be tested shall be kept under satisfactory sanitary conditions, and more especially that sufficient air space, ventilation, and light be provided in the buildings occupied by the animals.

16. We recommend that the Board of Agriculture in England and Scotland and the Veterinary Department of the Privy Council in Ireland undertake the circulation among agricultural societies of instructions for the proper use of the tuberculin test, with explanation of the significance of reaction, and directions for effective isolation of reacting animals.

THE GROWTH OF SUGAR-BEET, AND THE MANUFACTURE OF SUGAR, IN THE UNITED KINGDOM.

Contents.

Introduction.

Nearly thirty years ago, Mr. James Duncan established a sugar factory at Lavenham in Suffolk, and made arrangements with farmers in the locality to grow sugar-beet, for which he was to pay them about 20*s.* per ton, delivered to the factory,

We believe that Mr. Duncan commenced operations in 1869, and closed his factory in 1873. From results kindly furnished to us by Messrs. Newlands Brothers, it would appear that there was considerable advance from year to year in the quality of the roots grown. Thus, the analyses of numerous lots in 1869 showed an average of 8·39 per cent. of sugar; of several lots in 1870 of 9·19 per cent.; of five lots in 1871 of 10 59 per cent.; and of twelve lots in 1872, an average of 11·84 per cent. of sugar in the roots. It may be added that among the twelve lots analysed in 1872, the lowest percentage was 8·27, and the highest 15·15; whilst four gave over 13, two between 12 and 13, and two between 11 and 12 per cent.

Various local difficulties have been alleged as contributing to Mr. Duncan's want of success in his endeavours to establish the growth of sugar-beet, and the manufacture of sugar from it, at Lavenham; but one, if true, seems quite sufficient to account for the result, and it should be very carefully considered, and taken as a serious warning, in any future undertakings of the kind. It is said that with a requirement of at least 30,000 tons of roots to work his factory profitably, Mr. Duncan finally could only obtain about 7,000 tons. The fact appears to be, that the farmers did not sufficiently modify their rotations to secure an adequate supply of roots; and even in some cases they used for feeding purposes what they had grown, if other feed was scarce.

The question of the suitability of our climate for the production of the crop for the purposes of the manufacture, and also that of the effects of different manures on the growth of the crop and on its richness in sugar, led us to undertake some experiments at Rothamsted on the subject. As will be explained more in detail further on, the experiments were commenced in 1871 and continued for five years. In the autumn of 1871, one of us who had previously visited Mr. Duncan at Lavenham, went there to learn what progress had been made, and was kindly guided and supplied with much information by Mr. William Biddell. From Lavenham he went on to visit some of the chief sugar-beet districts in Germany, Austria, France, Belgium, and Holland; and continued the inquiry in the autumn of 1872. Full notes were taken, and a full report was written, embodying the information acquired; but, owing to the unfortunate collapse of Mr. Duncan's most laudable enterprise at Lavenham, the report was never published; and, for the same reason, the results of the Rothamsted experiments on the growth of sugar-beet by different manures, and over several seasons, attracted very little attention.

During the last few years, however, the subject of the growth of sugar-beet, and the establishment of factories for the manufacture of sugar from it, in this country, has been very much discussed; and we have been requested to write a paper on the present position of the question. At first sight, it certainly seems somewhat remarkable, that with a price in our markets of raw beetroot sugar (of 88·0 per cent. purity), of about 23*l.* 10*s.* per ton in 1870, of about 25*l.* in 1873, and of about 24*l.* in 1874, Mr. Duncan's attempt to introduce the crop and the manufacture into the country failed, and yet at the present time, with the price of sugar only about 9*l.* per ton, very sanguine expectations of the success of such an enterprise are put forward, and the scheme is strongly advocated as a means of resuscitating agricultural prosperity.

Our own early experiments were not arranged with a view to affording exact models for adoption in the growth of the crop for sugar-making, but were conducted much on the lines of our other experiments on root-crops. The results do, however, as will be seen, supply much valuable information on the effects of different manures on the quantity and on the composition of the crop, and so afford important data as to its manurial requirements. For direct application to practice in the growth of the crop for sugar-making, the amounts of nitrogenous manures used were too large, and the distances apart from plant to plant were too great; conditions leading to over-luxuriance and to imperfect maturing of the individual plants. We have, however, undertaken some experiments on a limited area in the present season; arranged more with the view of obtaining both fair luxuriance and at the same time adequate ripening, so as to ensure high percentage of sugar; and specially with a view to the latter point, we have obtained from Messrs. Vilmorin & Co., of Paris, seed of the most approved description at the present time.

The Rothamsted Experiments on Sugar-beet in 1871–5.

The experiments made at Rothamsted with sugar-beet were commenced in 1871, and continued for five years in succession to 1875 inclusive. They were conducted on the land which had been devoted to the continuous growth of root-crops (Norfolk Whites and Swedish turnips), from 1843 to 1870; excepting that in the three years 1853–5 barley was grown without manure to equalise the condition of the plots as far as possible before re-arranging them and the manuring.

During the first three of the five years of sugar-beet the

arrangement of the plots and of the manures was substantially the same as during the preceding ten years with Swedish turnips, and the subsequent years with mangel-wurzel. But during the last two years of the five, neither farmyard nor any other nitrogenous manure was applied; the object being to determine the effects of the unexhausted residue of the nitrogenous applications during the preceding three years. The description of sugar-beet grown was Vilmorin's "Green-top White Silesian." In 1871, the seed was dibbled on ridges in rows 26 inches apart, and 10 inches from plant to plant in the rows; in 1872 and subsequently it was dibbled on the flat, in rows 22¼ inches apart, and 11 inches apart in the rows; the plants being moulded up afterwards. The roots were all carted off, and weighed; the leaves weighed, spread on the respective plots, and ploughed in.

Table I. (p. 348) shows, for selected plots, the manuring, the average produce over the three years, of root and of leaf, the average percentages of nitrogen, and of mineral matter, in the dry matter of the roots, and the average percentages, and amounts per acre, of sugar in the roots over the three years, 1871–3, during which the farmyard manure and the nitrogenous cross-dressings were annually applied.

It will be seen that the nitrogenous cross-dressings, which were the same as those before and subsequently adopted for feeding roots, were very heavy; indeed, much heavier than is recognised as suitable in the case of beet grown for the production of sugar. The result was that when these were used in addition to farmyard manure, the produce of roots per acre was large, in some cases about twice as much as that obtained in the growth of sugar-beet for the manufacture of sugar in Germany or France at the present time. The farmyard manure alone gave an average over the three years of 16 tons 6 cwt. of roots; and the amount was raised to 23 tons 16 cwt. by the addition of 550 lb. nitrate of soda, containing 86 lb. of nitrogen; to 22 tons 6 cwt. by 400 lb. salts of ammonia, supplying 86 lb. of nitrogen; to 24 tons 18 cwt. by 2,000 lb. of rape-cake, containing 98 lb. of nitrogen; and to 25 tons 2 cwt. by rape-cake and salts of ammonia together, supplying annually 184 lb. of nitrogen.

The Table (p. 348) shows, however, that the amount of sugar in the roots in neither case reached 12 per cent.; but it was the highest, 11·84, with the farmyard manure alone and the smallest crop, and the lowest, 9·99 per cent., with the farmyard manure and the heaviest nitrogenous cross-dressing, and the heaviest crop. The roots of the other series, with inter-

Table I.—*Showing the Quantity and Composition of the Produce of Sugar-beet, with Different Descriptions and Amounts of Manure.*

Plot	Standard manures	Series 1. Standard manures only	Standard manures and cross-dressings each year as under: Series 2. 550 lb. nitrate of soda =86 lb. nitrogen	Series 3. 400 lb. salts of ammonia =86 lb. nitrogen	Series 4. 400 lb. salts of ammonia & 2,000 lb. rape-cake =184 lb. nitrogen	Series 5. 2,000 lb. rape-cake =98 lb. nitrogen
	Produce of Roots per Acre.					
		tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.
1	14 tons farmyard manure .	16 6	23 16	22 6	25 2	24 18
5	Superphosphate . . .	5 18	19 11	13 9	17 15	16 5
4 & 6	Superphosphate and potash	5 18	18 17	14 19	22 3	17 17
	Produce of Leaf per Acre.					
1	14 tons farmyard manure .	4 6	8 9	8 1	9 12	6 8
5	Superphosphate . . .	1 9	5 4	4 10	9 1	4 3
4 & 6	Superphosphate and potash	1 7	5 2	3 10	7 16	3 13
	Nitrogen per Cent. in the Dry Matter of the Roots.					
		per cent.	per cent.	per cent.	per cent.	per cent.
1	14 tons farmyard manure[1] .	0·83	1·24	1·31	1·74	1·24
5	Superphosphate . . .	0·58	0·96	1·00	1·55	0·88
4 & 6	Superphosphate and potash	0·58	0·95	0·81	1·27	0·82
	Mineral Matter (Ash) per Cent. in the Dry Matter of the Roots.					
1	14 tons farmyard manure .	4·96	5·92	5·74	6·37	5·42
5	Superphosphate . . .	3·85	5·08	3·97	5·33	3·90
4 & 6	Superphosphate and potash	4·11	5·13	4·75	5·59	4·54
	Sugar per Cent. in the Roots.					
1	14 tons farmyard manure .	11·84	10·42	10·81	9·99	10·81
5	Superphosphate . . .	13·08	10·66	11·88	9·89	12·17
4 & 6	Superphosphate and potash	12·97	11·04	12·16	10·66	12·07
	Sugar per Acre in the Roots.					
		lb.	lb.	lb.	lb.	lb.
1	14 tons farmyard manure .	4,309	5,508	5,413	5,630	5,976
5	Superphosphate . . .	1,731	4,661	3,563	3,886	4,407
4 & 6	Superphosphate and potash	1,704	4,635	4,063	5,279	4,788
	Increase of Sugar per Acre by Nitrogenous Cross-dressings.					
1	14 tons farmyard manure .	—	1,199	1,104	1,321	1,667
5	Superphosphate . . .	—	2,930	1,832	2,155	2,676
4 & 6	Superphosphate and potash	—	2,931	2,359	3,575	3,084

[1] The percentages of nitrogen given in this line relate to the crops of 1871 only.

mediate amounts of crop, had also intermediate percentages of sugar—namely, 10·42, 10·81, and 10·81. Further, the crop with the farmyard manure alone, and the highest percentage of sugar in the roots, had the smallest amount and proportion of leaf, and the smallest percentages of both nitrogen and mineral matter in the dry matter of the roots; whilst the crop yielding the highest produce of root, and the lowest percentage of sugar in the roots, had the highest proportion and amount of leaf (9 tons 12 cwt. per acre), and the highest percentages of nitrogen and of mineral matter in the roots, conditions indicating immaturity. To these points we shall recur again presently.

The results next recorded in the Table show the amounts of produce, roots and leaves, obtained with artificial mineral manures, both when used alone and with the nitrogenous cross-dressings as before described. The Table further shows the percentages of nitrogen and of mineral matter (ash) in the dry matter of the roots; also the percentages, and the amounts per acre, of sugar in the roots. It will be seen that the mineral manure used on plot 5 was superphosphate alone; and on plots 4 and 6 superphosphate with potash in addition (plot 4 having soda and magnesia also). The average produce of roots with either of these mineral manures used alone, was 5 tons 18 cwt. per acre; which was increased to 19 tons 11 cwt. and to 18 tons 17 cwt. by nitrate of soda =86 lb. nitrogen; to 13 tons 9 cwt. and to 14 tons 19 cwt. by salts of ammonia=86 lb. nitrogen; to 16 tons 5 cwt. and to 17 tons 17 cwt. by rape-cake=98 lb. nitrogen; and to 17 tons 15 cwt. and 22 tons 3 cwt. by salts of ammonia and rape-cake, together containing the excessive amount of 184 lb. of nitrogen. The figures further show that there was a greater produce of root, though not of leaf, in the case of three out of the four cross-dressings where potash was used as well as superphosphate; and that there was not more with than without potash where nitrate was used, is most probably explained by the fact that the nitrate distributes rapidly in the soil, encouraging a greater distribution of the roots, by which the plants acquire a greater command of the potash of the soil and subsoil. The result with the potash is fully established in other experiments; namely, that a liberal supply of it tends to root-formation and maturation, conditions favourable for the production of sugar.

The percentage of sugar in the roots is, with one exception, considerably higher where the mineral manures were used than where farmyard manure was employed, whether alone or with the cross-dressings. With the mineral manures used alone,

and less than 6 tons of roots produced, there was in one case rather over, and in the other very nearly, 13 per cent. of sugar in the roots; and in several other cases there was nearly, or over, 12 per cent. As in the case when farmyard manure was used, so now with the mineral manures, the lowest percentage of sugar in the roots was where the very excessive cross-dressing of 184 lb. of nitrogen was employed; and the amount and proportion of leaf to root at the time of taking up the crop was very large, showing that the produce was immature. In order of lowness of sugar per cent. in the roots of the other crops, came those with the cross-dressing of nitrate of soda, yielding large amounts of leaf; whilst the roots grown with the cross-dressings of salts of ammonia, or of rape-cake, showed, with somewhat smaller crops of both root and leaf, the highest percentages of sugar. It is perfectly consistent with these results as to the percentage of sugar in the roots, that in the case of plots 4 and 6, the percentages of nitrogen and of mineral matter in the roots were the lowest with the mineral manure alone and the highest percentage of sugar, and the highest with the excessive nitrogenous cross-dressing and the lowest per cent. of sugar. Next in order both as to highness of per cent. of both nitrogen and mineral matter, and lowness of per cent. of sugar, came the roots receiving the nitrate as a cross-dressing; and the roots with the cross-dressing of ammonia or of rape-cake, especially where potash was supplied, gave the lowest percentages of nitrogen and of mineral matter, and the highest percentages of sugar, among the crops with nitrogenous cross-dressings. Lastly, it is to be observed that with the nitrate, the salts of ammonia, and the salts of ammonia and rape-cake together, the percentage of sugar was distinctly higher with than without the potash; whilst where rape-cake alone was used as a cross-dressing (the rape-cake containing potash) the percentage of sugar is nearly the same without and with potash supplied.

It is quite evident from these results, that the amount of crop grown depended very largely upon the amount of nitrogen available within the soil; but that with crops forced beyond a certain moderate limit of produce, the proportion of leaf was unduly large, the percentages of nitrogen and of mineral matter in the root relatively high, and the percentage of sugar objectionably low; all these conditions indicating too much luxuriance and defective maturity at the time of taking up the crop.

The Table (p. 318) further shows, however, that the amount of sugar *per acre* also much depended on the nitrogen available within the soil. Thus, it is seen that when farmyard manure was the standard manure, notwithstanding a much lower percentage of

sugar in the roots with nitrogenous cross-dressings in addition, there was from a fourth to a third more sugar *per acre* with the cross-dressings than without; and when mineral manures were used as the standard manures, there was in every case more than twice, and in some nearly or quite three times, as much sugar per acre with as without the nitrogenous cross-dressings.

The bottom division of the table shows the actual increase of sugar produced over that obtained without nitrogenous cross-dressing, by each of the four cross-dressings, under each of the three conditions as to standard manure. This increase of sugar produced was very much less for a given amount of nitrogen supplied in the cross-dressings when they were used with the farmyard manure than with either of the mineral manures. With the nitrate the increased production of sugar was practically identical without and with potash in the standard manure; a result, as already referred to, most probably due to the great solubility and rapid distribution of the nitrate in the soil, leading to a greater root-development in the lower layers, thus giving the plants a greater command of the available potash of the subsoil, and so far rendering them less dependent on the more superficial supplies by manure. With each of the other three cross-dressings there was, however, a very marked increased production of sugar with potash supply compared with that without it.

So much for the average results obtained over three years, in our experiments on sugar-beet so long ago as 1871, 1872, and 1873. There were crops of less than 6 tons per acre, and of more than 25 tons. The percentage of sugar in the roots ranged from over 13 to under 10 per cent., according to the manuring, and the sugar per acre in the roots ranged from 1,704 to 5,976 lb., also according to the manuring.

We have for brevity thus given only the average results for three years, instead of those for each year separately. It may be stated, however, that notwithstanding the accumulation within the soil from year to year by the return of the leaves to the land, there was, with the higher manures, a tendency to reduction in produce of roots per acre from the first to the third year; and coincidently a tendency to higher percentages of sugar in the roots, especially comparing the second and third with the first season. This result is more probably due to the climatic characters of the respective seasons, than to the condition of the land; but it would occupy too much space to attempt to connect the differences of yield and composition with the differences of temperature and rainfall in the three seasons.

With the foregoing results before us, it will be of interest to

compare or contrast them with those obtained in some of the countries where sugar-beet is largely grown, and sugar is largely manufactured from it.

The Beetroot Sugar Industry in some Countries on the Continent of Europe.

When travelling to inspect some of the sugar-growing districts of Germany, Austria, France, Belgium and Holland, in 1871 and in 1872, it was found that in Germany, where the duty was paid upon the weight of roots submitted to manufacture, great attention was paid to get roots of high percentage of sugar and low percentages of "*non-sugar*," especially of nitrogenous and saline matters, which reduced the amount of crystallisable sugar obtained in the manufacture. It is strictly in accordance with the results of our own experiments which have been given, that roots of the desired character could only be produced by restricting the manuring, and by other methods of preventing over luxuriance, and favouring perfect ripening or maturity; in fact, by growing comparatively small roots and small crops per acre. Accordingly, strict rules were issued by the manufacturers to the growers, for the manuring, and for other conditions of growth. One of these was, that if farmyard manure were employed, some other crop, of feeding roots for example, should be taken before a crop was grown for sugar. Then the use of nitrate of soda was practically prohibited, though a small dressing of sulphate of ammonia might be used. The roots were to be grown at a limited distance between the rows, and between the plants in the rows. In no case was it found that the rows were more than 18 inches apart, and in some cases the distance from plant to plant in the rows was as little as 8 to 9 inches, and seldom more than 10 or 12. In this way, by limitation of the amount of nitrogenous manure, and growing the plants close together, over luxuriance was avoided, and ripe roots, with a high percentage of sugar and low amounts of nitrogenous and saline matters, were obtained. The average amount of roots submitted to manufacture, and chargeable with duty, was little more than 11 tons per acre.

In France, on the other hand, where the duty was then paid, not upon the roots, but on the manufactured sugar, and where the manufacturer was in a greater degree dependent on his neighbours for his roots than was the case in Germany, a very opposite system had grown up. In the North of France at that time, the produce of roots per acre was about double that of

Germany. As a rule, most of the manure available was applied directly to the beet crops; the other crops of the rotation being grown almost without direct manure. The result was, that the French roots were much larger and coarser, contained lower percentages of sugar, and higher percentages of nitrogenous and saline matters, than the German. Under these circumstances, a considerably larger quantity of roots had to be submitted to manufacture to obtain a given quantity of marketable sugar, and a less proportion of the existing sugar was obtained in that form. Nevertheless, the French system undoubtedly yielded more sugar from a given area of land, though at considerably more cost for manufacture.

Since July 1884, there has, however, been a great change in the French system. From that date the duty has been paid upon the roots instead of upon the sugar, and this has led to the necessity of producing roots as rich in sugar as possible, and to the payment for the roots by the manufacturer according to their richness in sugar; the price being fixed according to the density of the juice. It has thus become the interest of the cultivator to grow much smaller crops, with much higher percentages of sugar than formerly. Much more attention has also been paid to the character of the seed sown, so as to obtain roots rich in sugar.

Before referring to more recent statistics, it may be stated that, according to records quoted at p. 70 (2nd edition) of Mr. Sigmund Stein's pamphlet, it would appear that during the last twenty-five years the number of sugar factories in Germany has increased from about 300 to about 400, or by one-third. The quantity of beetroot worked has, however, increased about five-fold; the quantity of sugar produced from seven to eight fold; and the yield of raw sugar per cent. on the roots from about 8¼ to 13¼.

The following Table (II., p. 354) gives a summary of results quoted by Mr. Sigmund Stein at pp. 69–71 of his pamphlet; the results themselves being taken from the official statistics relating respectively to Germany and to France.

Referring to the figures in the upper division of the Table, relating to Germany, it is seen that during the eleven years 1886–7 to 1896–7, the number of sugar factories has remained comparatively stationary. On the other hand, the area under sugar-beet has increased by about one-half, the amount of roots submitted to manufacture by more than one-half, and the amount of raw sugar produced in a much greater proportion still. Naturally, there is fluctuation in the produce of roots per acre from year to year according to season; the

lowest amount recorded during the eleven years being 10·7 tons in 1887; the highest 13·3 tons in 1889 and in 1894; and the average of the eleven years amounts to 12·1 tons. Lastly, the amount of raw sugar produced per cent. on the roots varied during the same eleven years from 11·87 in 1886–7, to 13·11 in 1895–6, with an average over those eleven years of 12·33 per cent. But, it will be seen, it is stated that in 1884–5 the raw sugar obtained per cent. on the roots was only 10·79, and in 1885–6 only 10·43; the figures showing a marked increase subsequently to those years.

TABLE II.

Years	Number of sugar factories	Area under sugar-beet	Produce of roots per acre	Roots submitted to manufacture	Raw sugar produced	Raw sugar per cent. on the roots
			GERMANY.			
	no.	acres	tons	tons	tons	per cent.
1884–5	376	—	—	10,402,688	1,123,030	10·79
1885–6	408	—	—	7,070,317	808,105	10·43
1886–7	399	684,193	12·1	8,306,671	1,018,281	11·87
1887–8	401	651,815	10·7	6,963,960	958,863	13·08
1888–9	391	691,897	11·4	7,896,183	990,890	11·96
1889–90	396	752,259	13·3	9,822,635	1,261,353	12·36
1890–1	401	824,825	13·0	10,623,319	1,336.221	12·09
1891–2	405	861,583	11·4	9,488,002	1,198,025	12·06
1892–3	403	869,829	11·3	9,811,939	1,230,834	11·94
1893–4	401	954,995	11·1	10,644,351	1,366,001	12·34
1894–5	405	1,090,801	13·3	14,521,029	1,827,973	12·15
1895–6	397	930,749	12·5	11,672,816	1,637,057	13·11
1896–7	399	1,049,881	13·0	13,721,601	1,821,223	12·66
Mean	—	—	(12·1)	—	—	12·06
			FRANCE.			
1884–5	419	359,864	12·7	4,556,796	303,291	6·66
1885–6	413	283,987	11·9	3,385,439	294,538	8·70
1886–7	391	379,331	12·9	4,897,079	482,270	9·85
1887–8	375	397,512	9·1	3,614,632	383,019	10·60
1888–9	380	425,373	9·9	4,222,967	458,359	10·85
1889–90	373	472,821	13·0	6,676,051	777,073	11·61
1890–1	377	517,808	11·8	6,499,906	683,602	10·52
1891–2	368	551,955	10·2	5,628,804	612,023	11·41
1892–3	368	528,156	10·3	5,472,891	581,517	10·63
1893–4	370	543,615	9·6	5,250,192	571,987	10·89
1894–5	367	596,806	12·0	7,137,736	782,726	10·97
1895–6	356	505,558	10·7	5,411,484	659,607	12·19
1896–7	358	608,370	11·1	6,705,000	742,829	11·08
Mean	—	—	11·2	—	—	10·46

To form an estimate of the amount of pure sugar yielded

per 100 of roots, it is obvious that deduction would have to be made according to the degree of purity of the raw sugar, but to the amount so reduced there would have to be added the sugar obtained from, or remaining in, the molasses.

Turning now to the results relating to France, as given in the lower division of the Table, it is seen that there has been a gradual reduction in the number of sugar-factories during the thirteen years commencing with 1884–5, and ending with 1896–7; that is, since the new system as to the valuation of the roots, and the resulting changes in the cultivation and manufacture, have been adopted. Notwithstanding the reduction in the number of factories, there has been a gradual increase in the number of acres under the crop by about one-half, comparing the first five with the last five of the thirteen years. With the great improvement in the quality of the roots under the new system, the produce of roots per acre was, on the average of the thirteen years, only 11·2 tons, or rather less than the yield in Germany, and only about half as much as in France about twenty-five years ago. Nevertheless, the amount of roots submitted to manufacture has increased by about one-half, comparing the quantities over the last five years with those of the first five of the thirteen under the new system; whilst, reckoned in the same way, the raw sugar produced has increased by more than one half. Lastly, the amount of raw sugar obtained from 100 of roots has, under the new system, increased during the later compared with the earlier years; but the average amount over the thirteen years 1884–5 to 1896–7, for which there are corresponding particulars for Germany, show only 10·46 of raw sugar obtained from 100 of roots, against 12 06 over the same period in Germany. In any reckoning of the total amount of pure sugar yielded per 100 of roots in France, the amount obtained from, or remaining in, the molasses, would of course have to be added to that contained in the raw sugar; but the total yield, in raw sugar and molasses, would still be materially less than in Germany.

From the foregoing results relating to the sugar industry in Germany and France in recent years, it is obvious that, to get a high yield of sugar from the roots, only comparatively low yields of roots per acre can be obtained.

It has before been stated, that twenty-five years ago under the restrictions then in force as to the manuring and the cultivation of the sugar-beet crop in Germany, the average produce was not more than about 11 tons of roots per acre; but, as the Table shows, the average yield over the eleven years to 1896–7 was over 12 tons. The increase in produce per acre in recent

years is partly due to some changes in the manuring and cultivation of the crop. Formerly, as has been said, sulphate of ammonia was used in limited amount per acre; but nitrate of soda very seldom, owing to the reduced coefficient of purity of the juice when it was employed. More recently, however, nitrate of soda has been more and more used, almost to the exclusion of sulphate of ammonia; the difficulty as to the less purity of the juice of the beets being to a great extent obviated by growing the plants closer together, so as to prevent over-luxuriance and ensure the ripening of the roots. To maintain and to increase the percentage of sugar in the roots, great attention has also always been paid in Germany to the character of the seed sown; high character being attained by selection of the roots to be grown for seed; and in recent years higher and higher percentages have been obtained, so that, with even somewhat increased weight of roots per acre, the percentage of sugar in the roots has been increased, and that of the "non-sugar" diminished. The result is an almost perfect root for the purposes of manufacture.

It is obvious from the results in the Table (II., p. 351) that since the new system of purchasing the roots according to their richness in sugar has been adopted in France, the character of the roots for the purposes of sugar-making has been much improved, and their produce of manufactured sugar has been greatly increased. But hitherto, though with even smaller crops, as has been shown, a less yield of sugar per cent. on the roots is obtained than in Germany.

VALUE OF SUGAR-BEET ROOTS ACCORDING TO THEIR COMPOSITION.

The price which the manufacturer will pay for roots depends upon two factors:—First, the percentage of sugar in the roots; and, secondly, what is called the "coefficient of purity" of the juice. It is said that some German factories refuse roots containing less than 10 per cent. of sugar. But, whatever the percentage of sugar in the roots, the price given per ton depends largely on the purity of the juice. The degree of purity of the juice means the percentage in the dry matter of the juice of sugar as indicated by the polariscope. In other words, it means the percentage of sugar in the total dry substance of the juice.

For example, if the percentage of dry matter in the juice were found to be 16, and the percentage of sugar in the juice by polariscope were 12, it is obvious that the sugar would represent three-quarters of the dry substance; in other words, 75 per cent. If, on the other hand, the percentage of dry

matter in the juice were still 16, and that of the sugar 13, the percentage of sugar in the dry matter, that is the coefficient of purity of the juice, would be 81·25. Or, to give another example, if the percentage of dry matter in the juice were 17, and that of the sugar were 15, the co-efficient of purity of the juice would be 88·24. It may be said that a juice of a purity of 80 per cent. or more would be considered a good juice, and the price of the roots would accordingly be high; but roots with a juice of only 75 or lower per cent. purity, would command a lower price from the manufacturer, even although the percentage of sugar in them was the same in the two cases. An example of this may be given from the scale adopted at a sugar factory in the United States, which will be referred to in more detail further on. Thus, roots containing 12 per cent. of sugar, with a juice of 80 per cent. purity, were paid for at the rate of 4 dollars (=16*s.* 8*d.*) per ton; whilst roots still containing 12 per cent. of sugar, but with a juice of only 74 per cent. purity, were paid for at the rate of only 3 dollars (=12*s.* 6*d.*) per ton.

We are not aware of authentic records showing either the actual average percentage of sugar in the roots, or the actual scale of prices paid by the manufacturer for the roots according to their percentage of sugar, and the purity of the juice, in recent years in Germany; but we believe that when the percentage of sugar in the juice is above a certain amount, the question of the purity of the juice is disregarded.

The following Table (III., p. 358) is, however, founded on data given by Dr. Carl Stammer, one of the chief beetroot sugar experts in Germany, which were published some years ago. He gave results for thirteen different percentages of sugar in the roots, from 10, 10·5, 11·0, 11·5, and so on, up to 16·0, and for each of these percentages at six different degrees of purity of the juice. He then adopted the percentage of 12 sugar in the roots, with a purity of the juice of 80, and assumed this quality of root as unity, and valued it at 2 francs per 100 kilograms (=220½ lb.). Adopting his data, we have given in the Table, in English money, the value per ton of roots of the different percentages of sugar as shown at the head of the columns, each at the six different degrees of purity of juice.

Of course the actual standard price of roots of a fixed quality will vary considerably from time to time, according to the price of sugar in the market, and to the productiveness of the season, and other local circumstances. But the lesson to be learnt from the Table is, how great may be the difference in the value of the roots according to their composition; that is, according to their percentage of sugar, and to the degree of

purity of the juice. Roots of only 10 per cent. of sugar would most probably also have a low degree of purity of juice; and adopting the standard price upon which the Table is based, the value of the roots per ton would probably be only about 11*s.* or 12*s.* If the percentage of sugar in the roots were 11·0, the purity of the juice would probably be somewhat higher, but still low, and the price might range from 13*s.* to 15*s.* per ton. If the percentage of sugar were 12·0, a higher condition of juice might be expected, and the price might be from 16*s.* to 17*s.* per ton. With a percentage of sugar of 13·0, there would again probably be a higher purity of juice, and the price per ton of roots might, on the scale supposed, be from 17*s.* 6*d.* to about 20*s.* With 14·0, 15·0 or 16·0 per cent. of sugar in the roots, the purity of the juice would pretty certainly be high, and the value of the roots per ton might range from 20*s.* to 25*s.*

TABLE III.

Quotient of purity	Sugar in the Roots													
	10·0 per cent.		11·0 per cent.		12·0 per cent.		13·0 per cent.		14·0 per cent.		15·0 per cent.		16·0 per cent.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
70	11	11	13	0	14	2	15	5	16	7	17	9	19	0
75	12	8	13	10	15	3	16	5	17	9	19	0	20	4
80	13	6	15	0	16	3	17	7	19	0	20	4	21	8
85	14	6	15	9	17	3	18	6	20	2	21	6	23	1
90	15	3	16	9	18	3	19	10	21	4	22	11	24	5
95	16	1	17	7	19	4	20	10	22	7	24	1	25	8

Obviously, if the standard price of the period or locality were lower than that adopted in the construction of the Table, the price per ton for any given quality of roots would be lower; or if the standard price were higher, so would the price per ton of roots be higher for any given composition than that given in the Table.

It has been explained that the system in France before 1884 was for the manufacturer to purchase the roots by weight irrespectively of their composition, and the result was that large crops of low percentage of sugar, and doubtless low purity of juice, were produced. In 1884, however, the system being changed, and the roots from that time being paid for according to their composition, much smaller quantities of roots per acre, but with much higher percentages of sugar and higher quality of juice, have been grown, and accordingly much higher prices have been paid for the roots.

It will be useful to give an illustration of the condition of things in France prior to 1884, by giving a summary of a Table

published in 1876 by M. Georges, President du Comice Agricole of Saint-Quentin, at a time when the importance of payment according to composition had been recognised and discussed, though not definitely established, and when, as a first step, it was proposed to value the roots according to the density of the juice. M. Georges gave a Table for 31 different degrees of density, corresponding to from 13·3 to 6·7 per cent. of sugar in the roots; giving, at the same time, the yield obtained per 100 of roots of the different qualities, and the price per 1,000 kilos. (2,204½ lb.) accordingly. The following Table (IV.) is constructed according to the data given by M. Georges, and shows the value per ton of roots in English money for each percentage of sugar in the roots from 13 down to 7.

TABLE IV.

Sugar in the roots	Yield of sugar in the roots	Proportion of the total sugar yielded	Price per ton of roots
per cent.	per cent.	per cent.	*s.* *d.*
13	8·53	65·6	19 3
12	7·82	65·1	17 7
11	6·99	63·5	15 9
10	6·22	62·2	14 1
9	5·38	59 7	12 2
8	4 61	57·6	10 5
7	3·88	55·5	8 9

The first point to observe in the Table is, the small proportion of the total sugar in the roots that is obtained in the manufacture; the amount being only 65·6 per cent., with 13 per cent. of sugar in the roots, and as little as 55·5 per cent. with only 7 per cent. in the roots. Accordingly the estimated price per ton of the roots was 19*s.* 3*d.* with the highest percentage; gradually declining with each lower percentage of sugar, and lower proportion of the total sugar yielded, to only 8*s.* 9*d.* per ton with only 7 per cent. sugar in the roots, and the much lower proportion of the total sugar obtained in the manufacture; due, doubtless, to the much lower degree of purity of the juice. The much lower value to the manufacturer of roots not only lower in percentage of sugar, but with this having a proportionally lower degree of purity of the juice, and giving a lower yield from a given percentage, is here again clearly illustrated. The low yields of sugar obtained from the roots on the old system in France is also prominently brought to view.

The following illustrations of the comparatively large produce of roots per acre, of high percentages of sugar in the roots, and of high prices obtained per ton for them, in some special

instances, since the new law has been in force in France, and the roots have been paid for by the manufacturer according to their percentage of sugar as determined by the amount in the expressed juice, are of interest, and are in striking contrast to those given in Table IV. (p. 359). The results are given by Professor P. P. Dehérain, in a paper published in 1887—and in the following Table (V.) the quantities he gives are converted into English weights and money. The roots were grown at Wardrecques, Pas-de-Calais, and it is stated that the first four were obtained on small experimental areas, but the others in large culture. It is further stated that the conditions were in every respect arranged with the special object of obtaining roots of the highest possible quality and value.

TABLE V.

Description of seed, &c.	Per cent. sugar in the roots	Roots per acre		Sold at per ton	
	per cent.	tons	cwt.	s.	d.
Vilmorin, 1885	16·3	17	11	31	9
" 1886	—	15	19	31	11
Dippe, 1885	15·8	13	8	30	1
" 1886	—	13	11	27	8
Vilmorin and Dippe	14·7	19	1	25	10
	15·1	18	11	27	5
	16·4	16	8	36	9
	18·5	14	3	50	2
Vilmorin	—	—		42	11
Dippe	—	—		34	4

It will be seen that in the cases in which the percentage of sugar in the roots is given, it was very high; and not only in a very marked degree higher than in the range assumed in Table IV. (p. 359), relating to the period before the establishment in France of the rule of payment for the roots according to their richness in sugar, but also in some cases higher than the highest assumed in Table III. (p. 358), arranged specially for use in Germany. The weights of roots per acre, though very much lower than the earlier average for France, are nevertheless very high for such rich roots, and much higher than the average in Germany; and the percentages of sugar are also considerably higher than the average in Germany with only from 12 to 13 tons of roots per acre.

It is true that the above results were in a certain degree only experimentally obtained; but they are nevertheles interesting and instructive, as showing what may be done when sufficiently careful attention is paid to the essential conditions

of growth to obtain a good result. The prices given per ton of roots, which are stated to have been actually paid for them, show that they ranged from a minimum of 25*s.* 10*d.* with 14·7 per cent. of sugar, to 50*s.* 2*d.* with 18·5 per cent. of sugar! The prices were, in fact, in most cases one and a half time, and in some twice, as high as was proposed for roots of 13 per cent. sugar, as in Table IV. (p. 359), relating to the condition of things before the change of 1884. It is at any rate quite certain that such high percentages of sugar, with such large crops, could only be attained under exceptionally favourable conditions as to description of seed, character of soil, of manuring, of climate, and of cultivation. So far as can be judged from the particulars given, the manuring consisted, at any rate in some cases, of maize-cake, and in others of sulphate of ammonia, each with superphosphate in addition. Further, the most approved seed was used, and the plants were grown very close together, there being between eight and nine per square yard.

It may, of course, be a question, how far examples taken from countries like Germany and France, where the manufacturer of sugar is subject to the payment of heavy duties, and where, on the other hand, heavy bounties are given on the export of sugar, are any safe guide as to the probable range of prices that would prevail in our own country, if the growth of sugar-beet for sugar, and the manufacture of sugar from it, were established here under totally different fiscal conditions.

After the foregoing had been sent to the printer, we received an interesting communication on the conditions of sugar-beet cultivation in France at the present time, which has been very kindly prepared for us, in answer to questions we had submitted to him, by Monsieur E. Tisserand, formerly Director of the Ministry of Agriculture, Paris, but recently retired, and now Honorary Director.

The following is a translation of the document, with the quantities converted into their equivalents in English weights, measures, and values :—

1. Since the coming into force of the Law of 1884, which imposed the tax upon the beetroots submitted to manufacture, certain changes in the methods of cultivation have become necessary. The rotation remains, however, triennial as before: beetroot manured, wheat, and oats. It is essential that the organic manures—farmyard manure, compost, poudrettes, &c., should be put on the land as soon as the preceding crop is removed, and that their thorough mixing with it should be completed by the end of September, so that

they may have plenty of time to decompose and become well incorporated with the soil. Without this, they act too slowly on the vegetation, and so prevent the maturation of the roots at the time required. The quantity of farmyard manure applied is from 14 to 16 tons per acre; and this is supplemented in the spring by the application of from 3 to 5 cwt. per acre of bone or mineral superphosphate, and of from $2\frac{1}{4}$ to $3\frac{1}{4}$ cwt. of nitrate of soda. If the soil requires potash, this may be advantageously supplied by from $1\frac{1}{4}$ to $1\frac{3}{4}$ cwt. of chloride of potassium. The seed is sown in rows about 16 inches apart, so as to admit of the use of a horse-hoe, which is desirable for maintaining the proper condition of the soil. When the plants have developed four leaves, they should be thinned out, leaving one every 10 or 12 inches, so as to secure seven or eight per square yard, and by this close growth to prevent the individual plants attaining too great development, which is always injurious to the quality.

2. The beetroots are bought according to the density of the juice. The price is fixed for beetroots showing 7°, corresponding to 14 per cent. of sugar, according to the current price of sugar; the deviation ranging from 3*s.* 3*d.* to 5*s.* 6*d.*, according to the locality, and to the competition that there frequently is between the buyers. Example: If sugar is worth 12*s.* per cwt. during the months of manufacture, the standard price for roots should be 18*s.* to 22*s.* per ton at 7° density; with an increase or reduction of 6*d.* to 7*d.* for every tenth of a degree above or below 7°. Generally beetroots with a density below 6·5 are not received.

3. The quality of the roots is very variable, and depends much on the conditions of the weather during the growth of the crop. The months of September and October have very great influence in this respect. But it is of all things very important that the vegetation should be continuous, and not suffer any check during the hot weather of July and August.

4. Beetroots in France have an average of from 13 to 15 per cent. of sugar, and there is extracted in the manufacture from $9\frac{1}{2}$ to 12 per cent., according to the richness of the roots, and materially also according to the methods of working of the manufacturer.

5. In the estimates of the amounts of sugar extracted, sugar of at least 99 per cent. purity is to be understood.

6. Statistics show that in France the general average of the beetroot crop is 11 tons 3 cwt. per acre, and in Germany 12 tons 7 cwt. But, on a well managed farm, 14 to 16 tons of roots per acre, containing from 14 to 15 per cent. of sugar, are not seldom obtained.

7. The average price paid for roots during recent years has ranged from 19*s.* 6*d.* to over 21*s.* per ton, with a density of 7°.

8. The capital-value of the land is from 48*l.* to 64*l.* per acre, according to district, quality, situation, &c. According to the same conditions, the rental varies from 22*s.* 6*d.* to 42*s.* and 45*s.* per acre. For some years the price of white sugar No. 3 has been about 12*l.* 4*s.* per ton delivered in Paris; but varying between the extremes of 10*l.* 3*s.* and 13*l.* 8*s.*

Growth of Sugar-beet, and the Manufacture of Sugar from it, in the United States.

An illustration from the experience so far gained after a few years' trial in the United States, will be of interest. In January of the present year, Professor Woll, of the University of Wisconsin, at Madison, published a report on "Sugar-beet Investigations in Wisconsin in 1897," giving, besides others, the results of more than two thousand experiments on the growth of sugar-beet in that year, and of the analyses of the samples.

In reference to the question of the *Relative Value of Beets of Different Purities*, Professor Woll states that some factories do not receive beets showing less than 80 per cent. purity, whilst others receive them at a reduced scale of prices; and he quotes, as in the following Table (VI., p. 364), the schedule of prices in force at the Oxnard Beet Sugar Co.'s Factory, at Grand Island, Nebraska, according to the printed contract which the company makes with the sugar-beet growers. In the fourth column we have given the equivalent of the dollars in English money; in the fifth the values on the assumption of 20*s.*, and in the sixth on that of 25*s.* (instead of 16*s.* 8*d.*), as the price per ton for the highest quality of roots given in the Table.

It is seen that roots of 12, 13, and 14 per cent. sugar respectively, may each command the highest price, if those with 12 per cent. have a purity of not less than 80 per cent., those of 13 per cent. of not less than 78 per cent., whilst those of 14 per cent. are taken regardless of purity. Roots of 13 or 12 per cent. sugar have, however, a gradually declining value down to 3 dollars, as the degree of purity of the juice declines below 80 or 78. Further, roots with only 11 per cent. of sugar, but with a relatively high degree of purity, may have the same value per ton as those with 12 or 13 per cent. but with a lower degree of purity. Lastly, as the bottom lines of the Table show, roots with less than 13 per cent., less than 12, or less than 11 per cent., and with low degrees of purity, would be worth only 2½ dollars

per ton. Thus, roots may contain from 12 to 13 per cent. of sugar, and yet their value per ton may vary from 4 dollars (16*s.* 8*d.*) to 2·50 dollars (10*s.* 5*d.*), according to the degree of purity of the juice.

TABLE VI.

Beets containing not less sugar than—	Degree of purity of the juice	Prices per ton of roots						
		American scale			Assuming			
		dollars	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
12 per cent.	80 per cent.	4·00	16	8	20	0	25	0
14 „	Regardless of purity	4·00	16	8	20	0	25	0
13 „	Not lower than 78 p.c.	4·00	16	8	20	0	25	0
13 „	„ 76 „	3·75	15	7	18	9	23	5
12 „	„ 79 „							
13 „	„ 75 „	3·50	14	7	17	6	21	10
12 „	„ 78 „							
13 „	„ 74 „	3·25	13	6	16	3	20	4
12 „	„ 76 „							
11 „	„ 78 „							
13 „	„ 73 „	3·00	12	6	15	0	18	9
12 „	„ 74 „							
11 „	„ 75 „							
Below 13 p.c.	„ 73 „	2·50	10	5	12	6	15	7
„ 12 „	„ 74 „							
„ 11 „	„ 75 „							

The Table does not assume what would at the present time be considered high percentages of sugar in either Germany or France; and, especially with the lower percentages, the degrees of purity are also low. The figures, nevertheless, illustrate very clearly the importance to the grower as well as to the manufacturer of high quality of roots. For example, let us assume that a crop of 15 tons per acre grown from high quality of seed, with the land in good condition, appropriately manured, and not less than nine plants to the square yard, might, in a favourable season, contain not less than 13 per cent. of sugar, with a degree of purity of 78. It would then command, according to the American schedule, 16*s.* 8*d.* per ton; or let us assume 20*s.* per ton. If the crop reached 20 tons, the probability is that the percentage would not be more than 12, and the degree of purity not higher than 74, and the price would then be only 15*s.* a ton. Or, if the crop reached 25 tons, the percentage of sugar would probably not exceed 11, and the degree of purity would be low;

in which case the price would be only 12*s.* 6*d.* per ton. On these assumptions the value of the crops per acre would be as follows:—

	£	s.	d.
15 tons at 20*s.* per ton	15	0	0
20 tons at 15*s.* per ton	15	0	0
25 tons at 12*s.* 6*d.* per ton	15	12	6

This is only one illustration, on certain fixed assumptions, which by no means exaggerate the probable differences in composition and value of such crops. Indeed, the probability is that, in actual practice, the differences in favour of growing comparatively small crops, with high percentage of sugar and high purity of juice, the result of perfect maturation, would frequently be much greater than the figures above given suppose. Then, it is unlikely that crops of 15 tons per acre could, in the average of seasons, be grown of such quality as is above assumed; whilst crops ranging from 12 to 15 tons, if grown from suitable seed, and under suitable conditions as to soil, manuring, and cultivation, would probably yield roots of higher quality, commanding higher rates of value than those above supposed.

General Conclusions.

One of the first questions to consider in forming a judgment as to whether success would attend an extended growth of sugar-beet, and the establishment of factories for the manufacture of sugar, in this country is—at what price of sugar is it probable that such an enterprise would be profitable? Mr. Sigmund Stein estimates that 400 factories, each costing about 50,000*l.*, would supply all the sugar required for consumption in the United Kingdom. Going into more detail he says: "A sugar factory working 40,000 tons of roots, the crop of say 3,000 acres, would produce about 5,000 (5,200) tons of sugar, and would cost to erect about 60,000*l.*" Giving a summary balance sheet, he reckons that there would be a profit of over 6 per cent. on the 60,000*l.* capital, if the price of sugar were 9*l.* per ton, of 14¾ per cent. if 10*l.*, of 23·4 per cent. if 11*l.*, and of 32 per cent. if 12*l.* per ton.

Besides the great pecuniary advantages thus assumed on the expenditure of capital in the erection and working of sugar factories, there has, of course, to be taken into account the benefits that would accrue to agriculture, in the profitable employment of so much land, and also of so much labour, both in the field and in the factory. In Mr. Stein's estimate of the pecuniary benefits to the farmer, he takes the cost per acre of

growing sugar-beet at 10*l.*, and assumes that he will receive 18*s.* a ton for fifteen tons of roots delivered to the factory. If the farmer were to be paid for 15 tons of roots, this must mean 15 tons after cleaning and trimming, which implies considerably more than fifteen tons of gross produce of roots per acre. Then Mr. Stein reckons that the roots would produce 13·3 per cent. of sugar, and says that its cost price would be 9*l.* per ton. We assume that raw sugar, not refined, is meant; but it is important to know the percentage of pure sugar in the product. If refined sugar were meant, there would have to be more than that percentage in the roots grown; and although in favourable localities and seasons it would probably be obtained, it is not likely that it would be in roots of 15 tons per acre or more, taking the average of seasons. In fact, if the land were to produce 15 tons or more per acre of roots, containing say between 13 and 14 per cent. of sugar, the cost per acre of manuring and cultivation, with other expenses, would be more than 10*l.*, and the farmer would not be satisfied with 18*s.* per ton for trimmed roots. Still less would he be so if the desired richness in sugar could only be attained with smaller crops per acre.

It may here be observed that it is difficult to follow some of Mr. Stein's calculations. For example, in reckoning the profit to the farmer on growing 15 tons of roots per acre, he credits him with 1*l.* 5*s.* for the value of 5 tons of leaves and heads from the roots, thus mixing them up together, and rendering it impossible to form an estimate of the probable loss of weight of roots by trimming. He also reckons 3 tons of slices (pulp) equal 20 per cent. of the quantity of roots delivered, valuing them at 10*s.* per ton to the farmer [1]; but in estimating the profits of the factory he reckons the slices at 30 per cent. of the weight of roots, but still values them at 10*s.* per ton. In fact, although Mr. Stein's pamphlet supplies a great deal of valuable information, the details do not afford a sufficient basis to justify the opinion that the farmer would make the profit supposed, or that the factory would earn 6 per cent. on the capital with a price of 9*l.* per ton of sugar, or as much as is assumed with the respective prices of 10*l.*, 11*l.*, or 12*l.* per ton of sugar.

With regard to the suitability of the climate of the British Isles for the growth of beetroot in sufficient quantity, and at the same time of adequate richness in sugar, Mr. Stein says that it has been proved by hundreds of experiments during the last

[1] In his first edition he reckoned 6 tons of slices equal 40 per cent. of the quantity of roots delivered, valuing them at 5*s.* per ton to the farmer.

fifty years—"that the sugar contained in the home-grown beetroot is not only equal to, but even surpasses, that contained in the beetroot grown on the Continent of Europe." We certainly are not aware of the results referred to, and although we do not doubt that crops of adequate quantity and quality could be grown in suitable localities, and in some seasons, we do not believe that they could be over the country generally, or on the average of seasons. Then, Mr. D. T. Fish, writing in the *Agricultural Gazette* asks: "Who needs experimental plots to prove the practicability of good profitable crops of sugar-beet in our soil and climate? Assuredly not those farmers to be found in thousands on both sides of the Tweed who can grow mangels, swedes, or turnips to almost any weight from 20 to 40 tons per acre?" So far as the experience in the growth of the different descriptions of feeding roots above enumerated, in different parts of the country, is concerned, it certainly does not point to the conclusion that the climate of Great Britain as a whole is well suited to grow sugar-beet for the economical production of sugar. It is generally recognised that feeding mangels, which are closely allied to the sugar-beet, thrive the best in the warmest parts of England; and they are very little grown in Scotland.

Those who have thoroughly studied the question of the most suitable temperature for the growth of sugar-beet, come to the conclusion that a summer *mean temperature* of not less than 70° F. is desirable to ensure success. Dr. H. W. Wiley, Chief of the Division of Chemistry of the Department of Agriculture, at Washington, says: "As a result of many years' careful experimentation, it may be said that as far as temperature alone is concerned the sugar-beet attains its greatest perfection in a zone of varying width through the centre of which passes the isothermal line of 70° F. for the months of June, July, and August." He then describes the course of this isothermal line, and says:—"Extending a distance of 100 miles on each side of this isothermal line is a belt which, for the present, may be regarded as the theoretical beet-sugar area of the United States." Indeed, the area in the United States which so far as temperature is concerned is suitable for the growth of the crop for the manufacture of sugar, points to the possibility that the United States may before very long produce all the sugar they require; and it is understood that in order to encourage the home-industry, the United States Government have it in contemplation to put a Customs duty on imported sugar equivalent to the bounties granted in the countries of export.

How far even the East and South of England are from having an average summer and autumn mean temperature of 70° F. may be judged from the figures in the following Table (VII.), showing the average *maximum*, *minimum*, and *mean temperatures*, at Greenwich, over the period of fifty years from 1841 to 1890, in each of the months of June, July, August, September, October, and November.

TABLE VII.

Temperature	June	July	August	Sept.	October	November
	°F.	°F.	°F.	°F.	°F.	°F.
Maximum . .	70 9	74 0	72 8	67 3	57 7	48 8
Minimum . .	49 9	53 1	53 0	49 1	43 3	37 6
Mean . . .	59 4	62 5	61 6	57 2	50 0	43 2

It will be seen that although the months of June, July, and August, show an average *maximum* temperature of more than 70° F., and September not 3° below it, the highest *mean* temperatures are—in July only 62·5°, in August 61·6°, in June 59·4°, and in September 57·2° F. Not a single month, therefore, approaches to an average *mean temperature* of 70° F., whilst that of September is less than 60°, and that of October only 50°. It is obvious, therefore, that so far as temperature is concerned, we should be at a disadvantage compared with other beetroot sugar producing countries. Nevertheless, it is probable that, in the majority of seasons, sugar-beet could be grown of fair quality for sugar-making in the most favourable districts of the country, which would be in the eastern and southern counties. Every farmer knows the importance of autumn growth for feeding roots; but October is often a rainy month, little suited for the ripening of a sugar crop; whilst sugar-beet would be very liable to injury from early frosts, a risk which would have to be avoided by not leaving the crop out too long, even if the growth was still active. An important means of securing early maturity is, however, the growing of the plants so close together as to limit luxuriance, and favour ripening.

Assuming that the result of all the discussion that is now taking place on the sugar-beet question were the formation of companies with sufficient capital to establish sugar factories in some of the most promising districts for the growth of the roots, it is probable that Norfolk or Suffolk would be the first selected as having the most suitable climate. The next important point would be to select soils adapted to the purpose, which should be of a medium character, neither too heavy nor too light. There are sufficient areas of such soils in the counties named;

but the difficulty would be to find enough within sufficiently easy reach of a factory. Supposing an average of 15 tons of trimmed roots per acre, of high quality, were aimed at, it would require not much less than 3,000 acres to supply 40,000 tons to the factory; though it is doubtful whether so much of high quality, commanding the highest price, would be obtained on the average of seasons. Then, as sugar-beet would not be grown every year, and perhaps not as often as once in two years, it would require about 6,000 acres, or more, according to the rotation adopted, to be devoted to the purpose, to ensure the necessary supply to the factory, and certainly not a step should be taken towards the establishment of a factory until the necessary supply of roots had been assured. It is, however, probable that for some time at any rate, the company would themselves have to grow a considerable quantity of the beets they required. Further, it is pretty certain that it would require an offer of more than 18*s*. per ton, to tempt farmers to engage to grow on the average sufficient roots of the high quality desired. For, as has been stated, if 15 tons of trimmed roots had to be supplied, more than 15 tons of gross produce would have to be grown, whilst it is doubtful if such crops would on the average be rich enough in sugar; and if less crops had to be grown to secure good quality, the return per acre to the farmer would be so much the less.

Obviously, if considerable areas of land were devoted to sugar-beet in the localities the most suitable as to climate and other circumstances for its growth, and factories were established for the manufacture of sugar from it, there would be greatly increased employment for the population; and it is a question whether the local labour of the districts would be adequate for the autumn work in the fields, and subsequently for that required in the working of the factory. In fact, there is little doubt that the wages of the locality would rise.

Reviewing the whole of the facts that have been adduced, both as to the climate and other conditions essential for the production of sugar-beet in sufficient quantity, and of sufficient quality, we are disposed to think that so far as the production of the roots is concerned, it could only be a success over comparatively limited areas, and not throughout the agricultural districts of Great Britain generally. Then, as to the profits of the sugar factories if established, the cost to the companies of roots of good quality would pretty certainly be more than has been estimated; and it is very doubtful whether, with the present price of sugar in the market, adequate profits from the manu-

facture could be expected. Supposing that the bounties granted in the chief beetroot sugar producing countries on the Continent of Europe on the export of sugar were either abolished or considerably reduced, the price of sugar would probably rise in our own country, but whether sufficiently to ensure the success of sugar-beet growing, and of sugar factories established here on a considerable scale, may be doubted.

In writing upon the subject of Allotments and Small Holdings [1] some years ago, we pointed out that by reason of our less favourable climate we suffered under disadvantages compared with some continental countries in the profitable production of certain industrial and market garden crops, and other products, which occupied the labour of small holders on the Continent. In what we have now said as to the growth of sugar-beet, and the production of sugar from it, in this country, we can, of course, have no wish to discourage an enterprise which, if successful, would not only contribute to the increased prosperity of our agriculture, but would add to our manufacturing industries. But, having been asked to write upon the subject, we felt it incumbent upon us to endeavour to supply such information as we were able, on various points, especially with regard to the essential conditions for the successful growth of a sugar-crop, at the same time not overlooking the commercial aspects of the subject. Our object has, in fact, been, as far as possible, to aid those who are disposed to consider the question to form a reasonable judgment on the probabilities of success. It is, we think, at any rate clear that, if the sugar-beet industry is to be established with any prospect of success, great caution should be exercised in the choice of the locality or localities, and that the undertakings should, in the first instance, be limited in number and confined to the most suitable localities. Should success in these accrue, the enterprise could easily be extended, for capital is never wanting in this country for any undertaking which has a fair prospect of success.

JOHN BENNET LAWES.
J. HENRY GILBERT.

Rothamsted.

[1] Journal R.A.S.E., 3rd series, vol. iii. 1892, pp. 439-463.

Official Reports.

REPORT OF THE COUNCIL

TO THE

FIFTY-NINTH ANNIVERSARY GENERAL MEETING OF GOVERNORS AND MEMBERS OF THE SOCIETY,

HELD AT THE SOCIETY'S HOUSE,

13 *Hanover Square, W.*,

ON MONDAY, MAY 23, 1898,

EARL SPENCER, K.G. (President), in the Chair.

THE Council have to report the following changes in the list of Governors and Members during the year which has elapsed since the last Anniversary Meeting in May 1897 :—3 new Governors and 447 Members have joined the Society, 9 have been reinstated under Bye-Law 12, and 3 Members have qualified as Governors; whilst the deaths of 4 Annual Governors, 8 Life Governors, 69 Life Members, and 118 Annual Members have been reported. A total of 17 Members have been struck off the books under Bye-law 10, owing to absence of addresses; 158 under Bye-law 11, for arrears of subscriptions; and 209 have resigned.

2. Amongst other Governors and Members whose loss by death the Society has had to deplore since the General Meeting in December last are :—The Duke of St. Albans, the Marquis of Exeter, the Earl of Bradford, the Earl of Cawdor, the Earl of Strafford, the Earl of Suffolk and Berkshire, Viscount Combermere, Lord Carlingford, Lord De L Isle and Dudley, Lord De Mauley, and Lord Hillingdon; Sir John Smith, of Parkfield, Derby, Lt.-Gen. Sir H. M. Havelock-Allan, Bart., V.C., M.P., Lt.-Col. F. St. John N. Barne, of Sotterley Park, Wangford, Lt.-Col. H. C. S. Dyer, of Elswick, Newcastle-on-Tyne, Mr. W. Christie-Miller, of Britwell Court, Burnham, Bucks, Mr. Samuel Ginders, of The Haugh, Stafford (a Member since 1841), Mr. Alfred Morrison, of Fonthill House, Hindon, Wilts, Mr. Henry Simmons, of Bearwood, Wokingham, and Mr. Edmund Tattersall (a Member since 1840).

3. These and other changes bring the total number of Governors and Members now on the Register to 11,094, divided as follows :—

12	Foundation Life Governors (Members elected before the granting of the Charter on March 26, 1840) ;
79	Governors paying an annual subscription of 5*l.* ;
109	Life Governors ;
7,182	Members paying an annual subscription of 1*l.* ;
3,579	Life Members ;
108	Life Members by Examination ;
25	Honorary Members ;
11,094	Total number of Governors and Members,

as against a total of 11,223 Members at the same period last year.

4. To fill the vacancy caused by the resignation of Mr. John Tremayne, Mr. J. C. Williams, of Caerhays Castle, St. Austell, Cornwall, has been elected a Member of the Council.

5. The Council congratulate the Members upon the increasingly satisfactory condition of the Society's finances. The accounts for the year 1897 have been examined and certified by the auditors and accountants of the Society, and are published in the current number of the Journal. The final results are that the total assets on December 31, 1897, amounted to 48,572*l.* 5*s.* 0*d*, as against 45,875*l.* 1*s.* 11*d.* at the end of 1896. Acting upon the policy expressed in their Report to the General Meeting of May 22, 1895, of increasing, as opportunity offers, the Society's interest in the Harewood House Debenture Stock, the Council have recently purchased 2,700*l.* more of such Stock, as being the net increase in the assets during 1897 ; so that the invested funds of the Society are now represented by 16,000*l.* Consols, and 18,300*l.* Harewood House Stock.

6. It must not, however, be forgotten that the maintenance and extension of the Society's operations depend upon a continued flow of new subscribers. At least 500 new Members need to be elected every year to take the place of those who die or retire. The Council desire, therefore, particularly to invite each Member to interest himself in obtaining new subscribers to the Society, and to suggest the names of any farmers or others interested in agriculture in his district or of his acquaintance who would be likely to become Members. The Secretary will, upon receipt of instructions, either write direct to the gentlemen named, or will forward a supply of application forms to the nominating Member. A form of nomination is printed in each number of the Journal.

7. The rapidly increasing work in all departments of the Society's operations, coupled with the imminent resignation by the Hon. Cecil Parker of the post of Honorary Director, which he has now held with such advantage to the Society for the last six years, has rendered necessary a careful reconsideration of the present system of administration of the annual Country Meetings. A Special

Committee of the Council has therefore gone fully into this matter, and has reported its opinion that, while retaining the office of Honorary Director (a post which Mr. Percy E. Crutchley has kindly consented to accept for the next three years), it is absolutely necessary that a permanent paid official directly responsible to the Council should be appointed, whose duties would be principally confined to all matters relating to the Show and Showyards. On the recommendation of the Special Committee, the Council have resolved to appoint such an official, to be styled "Assistant Director," at a salary of 700*l.* per annum, and they propose to proceed with the appointment at as early a date as possible, in order that the new officer may have an opportunity of familiarising himself with his duties at the forthcoming Meeting at Birmingham. The Council have appointed Mr. Robert S. Burgess as Superintendent of the Showyard, in the room of the late Mr. James Bennison, who succeeded his father, Mr. Wilson Bennison, as Surveyor to the Society in 1896, and who died in January last.

8. Active preparations are now in progress for the holding of the Society's fifty-ninth Annual Country Meeting at Four Oaks Park, Sutton Coldfield, Birmingham, next month. The Implement Yard and Dairy will be opened on Saturday, June 18, when the price of admission to the public will be 2*s.* 6*d.* On Monday, June 20, all departments of the Birmingham Meeting will be opened, and the judging of live stock and poultry will commence. Admission to the Showyard on that day will be 5*s.* Tuesday, June 21, will be the first day for visitors not specially interested in the judging; and on that date there will be the first parades of horses and cattle. The price of admission on Tuesday, June 21, and on Wednesday, June 22, will be 2*s.* 6*d.* On Thursday, June 23, and Friday, June 24, all departments of the Show will remain open, and the price of admission will be 1*s.*

9. The total amount of space allotted in the Implement Department of the Birmingham Meeting is 15,491 feet run, exclusive of open ground space, as compared with 15,532 feet at Manchester last year, 13,930 feet at Leicester in 1896, 12,597 feet at Darlington in 1895, 13,402 feet at Cambridge in 1894, 13,018 feet at Chester in 1893, and 15,602 feet at Windsor in 1889. Nine entries have been received for the prizes, amounting to 300*l.*, offered by the Society for self-moving vehicles, the trials of which will commence on Monday, June 13, in the neighbourhood of Sutton Coldfield. Seventeen entries have been received for the prize of 10*l.* offered by the Society for the best method of safe-guarding Chaff-cutters to comply with the Chaff-cutting Machines (Accidents) Act of 1897. The trial of the competing appliances will take place at the Shoeing Forge in the Showyard on Friday, June 17, commencing at 9 A.M. Eighty "New Implements" have been entered for the Society's Silver Medals.

10. In the live-stock department there are 2,323 entries, as compared with 2,688 at Manchester last year, 1,883 at Leicester in 1896, and 1,703 at Darlington in 1895. At the Birmingham Meeting there will be 709 entries of horses, as compared with 981 at Manchester last year; 792 cattle, as compared with 821; 624 sheep, as compared with 701; and 198 pigs, as compared with 185 at Manchester. These figures, whilst less than those of the exceptional Meeting held at Manchester in 1897, are considerably above the average of recent years.

11. In the other departments of the Birmingham Meeting, there are 964 entries of poultry, 224 of butter, 121 of cheese, 112 of cider and perry, and 178 of hives, honey, &c. There will be daily demonstrations in the Showyard by Mr. Edward Brown of the cramming, plucking, and trussing of poultry for the table. For the prizes offered for shoeing hunters and dray horses, open to shoeing-smiths in any part of the United Kingdom, 73 entries have been received.

12. In 1892, the Council determined to publish the names of the Judges selected for the Society's Country Meetings, before the closing of the entries, and this procedure has since been annually followed. The Council are now of opinion that the time has arrived when the further step—often advocated in the past—should be taken of supplying the Judges with a copy of the printed catalogue when they enter the ring. They have accordingly adopted a resolution to this effect, and the catalogue will therefore be placed in the hands of the Judges at the forthcoming Birmingham Meeting.

13. In connection with the Society's Maidstone Meeting of 1899, the Council have decided to offer a Prize of 50*l.* for the best machine for washing hops with liquid insecticides, to be worked by horse-power or mechanical power. The detailed regulations for the trials of these machines, which will be held in a Kentish Hop Garden in June 1899, have been issued, and the entries will close on March 15, 1899.

14. In their last report the Council announced that, in consequence of the postponement until 1899 of the Maidstone Meeting (for District D), the Country Meeting of 1900 would be held in District E, consisting of the county of York. They have now the pleasure to state that they have received and accepted a cordial invitation from the Lord Mayor and Corporation of York, for the holding of the Meeting of 1900 in that City.

15. The Society's Country Meeting for the year 1901 will be held in District F, consisting of the counties of Gloucester, Hereford, Monmouth, Salop, Stafford, Warwick, Worcester, and of South Wales.

16. The remarkable decrease in the number of outbreaks of swine fever, to which the Council referred in the report of December

last, was unfortunately not maintained. On the contrary, a serious recrudescence of the disease occurred in the beginning of this year. In the twenty weeks up to May 14, 1,045 outbreaks were reported, against 1,184 outbreaks in the corresponding period of last year. In the same period anthrax increased slightly. Glanders has not altered materially in its rate of prevalence. Under the influence of the Muzzling Order, rabies has declined to a remarkable extent. A case of pleuro-pneumonia was detected in January last in the East of London, and led to the slaughter of over two hundred cattle which had been exposed to infection. No further cases of the disease were discovered. Among foreign animals landed for slaughter at the ports in this country, no contagious or infectious diseases were detected, excepting swine fever in one cargo of swine from the United States and some cases of sheep scab among sheep from North America and the Argentine.

17. In the Department of Comparative Pathology and Bacteriology, established at the Royal Veterinary College by the aid of a grant from the Society, specimens from 190 cases of disease have been examined for veterinary surgeons and others, chiefly with a view to diagnosis, and 1,772 doses of mallein have been supplied gratis to veterinary surgeons for use in the diagnosis of glanders. Experiments bearing on the generalisation of tuberculosis, the treatment of parasitic gastritis, and the causation of contagious aphtha in lambs have been carried out.

18. The Council have adopted a new scheme for the annual award of the Society's Silver and Bronze Medals to students of cattle pathology, including the diseases of cattle, sheep, and swine. Under this scheme an annual written, oral, and practical examination will be conducted by the professors at the Royal Veterinary College of students of that College who have completed their course of study, and who are eligible for the final examination of the Royal College of Veterinary Surgeons.

19. There has been some increase this year as compared with last in the number of samples submitted by Members for analysis in the Society's laboratory. From December 1, 1897, to April 30, 1898, 510 samples have been sent, as against 431 during the corresponding period of last year.

20. At the Society's Woburn Experimental Station, the usual winter feeding experiments both with bullocks and with sheep have been carried out. The field experiments are continued as before. The new laboratory at Woburn was completed early in the year, and is now in full working order. All analytical work in connection with the field and feeding experiments is now conducted in the new laboratory, as also, so far as permits, other work of experimental inquiry. The new "pot culture" station at Woburn has also been fully established, and experiments are already in

progress in connection with the scheme for carrying out the intentions of the Hills' Bequest.

21. A first joint report from the Consulting Botanist and the Consulting Chemist on the progress of the Society's Grass Experiments has been published in the last number of the Journal (Vol. IX., Pt. I., 1898, p. 137). These experiments are being continued.

22. The most important matter demanding the attention of the Consulting Botanist has been the extensive injury to clovers by the attack of the parasitic fungus, *Sclerotinia Trifoliorum*, which was observed for the first time in England only a year ago. It is this year spread over the whole country, and in many places has destroyed more than half of the clover. Red clover, trefoil, and sainfoin have been completely killed where the attack has been severe. Where the root has not been destroyed there is a hope that vigorous and healthy shoots may yet be produced. A case of larch canker, which has nearly destroyed a whole plantation, has been investigated, and it has been demonstrated that the disease was introduced from the nursery. Great care should be exercised, if diseased larches are found among young plants, that the whole be returned to the nursery.

23. During the past six months the Zoologist has dealt with many applications concerning such familiar pests as wire-worm, surface caterpillars, warble-fly, black currant gall-mite, and wheat bulb fly. Among the less common pests, advice has been given with regard to eelworm (*Heterodera radicicola*) in cucumber roots, weevil maggots (*Otiorrhynchus*) in hop roots, and bulbs infested by grubs of the fly *Merodon equestris*. Many cases of clover sickness have been reported, but, though eelworm has been occasionally present, and the grubs of *Sitones* weevils have been unusually numerous at the roots, failure has generally been found to be due to presence of the fungus reported by the Consulting Botanist. Last autumn the establishment in England of the American apple maggot (*Trypeta pomonella*) was noted, and the matter will be carefully investigated during the coming summer.

24. For the Society's Examination in the Science and Practice of Agriculture, held from the 10th to the 14th of this month, forty-eight candidates entered, forty-two of whom actually competed. The answers of the candidates are now under consideration, and the results will be announced as soon as possible.

By Order of the Council,

ERNEST CLARKE,

Secretary.

13 Hanover Square, W.

REPORT OF EDUCATION COMMITTEE ON THE RESULTS OF THE EXAMINATION IN AGRICULTURE, 1898.

THE Committee have to report that for the Society's Examination in the Science and Practice of Agriculture, held from the 10th to the 14th of May, 1898, forty-eight candidates entered, of whom forty-two competed, and that twenty-four of the competitors have satisfied the Examiners.

2. The following fourteen candidates, placed in order of merit, have gained the Society's Diploma in the Science and Practice of Agriculture. The first candidate (having obtained over three-fourths of the maximum number of marks—1500) will also receive Life Membership of the Society and the Gold Medal. The next four candidates (having obtained over two-thirds of the maximum number of marks) will each receive the Life Membership of the Society and the Silver Medal.

1. THOMAS HACKING, Durham College of Science, Newcastle-on-Tyne.—(1154 marks.) *Gold Medal and Life Membership of the Society.*
2. SAMUEL FRASER, Agricultural and Horticultural School, Holmes Chapel, Cheshire.—(1111 marks.) *Silver Medal and Life Membership of the Society.*
3. { JOHN OLLERTON PEET, The University, Edinburgh.—(1096 marks.) *Silver Medal and Life Membership of the Society.*
   STANLEY RACKHAM, The Agricultural College, Aspatria.—(1096 marks.) *Silver Medal and Life Membership of the Society.* }
5. JOHN LESLIE, The University, Edinburgh. — (1070 marks.) *Silver Medal and Life Membership of the Society.*
6. JAMES PIMLOTT, Agricultural and Horticultural School, Holmes Chapel, Cheshire.
7. ROBERT GWILLIM, The Agricultural College, Aspatria.
8. JOHN WILLIAMSON, Agricultural and Horticultural School, Holmes Chapel, Cheshire.
9. ERIC RICHARDSON, University College, Nottingham.
10. EDMUND WALLER, Royal Agricultural College, Cirencester.
11. FRED SMITH, Agricultural and Horticultural School, Holmes Chapel, Cheshire.
12. WILLIAM HENRY BEBBINGTON, Agricultural and Horticultural School, Holmes Chapel, Cheshire.
13. WILLIAM ARTHUR BRIGGS, University College, Nottingham.
14. JOHN HUBERT SOANS, University College, Nottingham.

3. The following ten candidates having passed in Agriculture and in three of the four other compulsory subjects, are entitled to Second Class Certificates :—

15. Sydney Francis Ashby, The University, Edinburgh.
16. Eric Arthur Nobbs, The University, Edinburgh.
17. William Reynolds, Agricultural and Horticultural School, Holmes Chapel, Cheshire.
18. Thomas Newton, Agricultural and Horticultural School, Holmes Chapel, Cheshire.
19. Bernard William Bull, Agricultural and Horticultural School, Holmes Chapel, Cheshire.
20. Edmund Brand, The Agricultural College, Uckfield.
21. Arthur Preston Ker, The Agricultural College, Aspatria.
22. Henry R. Woodfine, The Agricultural College, Uckfield.
23. Cyril John Whitbread, University College, Nottingham.
24. Alexander Scott Cromar, University College, Nottingham.

4. Of the compulsory subjects, ten candidates failed in Agriculture, twelve in Chemistry, twenty-four in Book-keeping, eighteen in Land Surveying, and eight in Agricultural Engineering. Of the optional subjects, there were fourteen failures in Botany, seven in Geology, six in Agricultural Entomology, and thirteen in Veterinary Science.

5. The Examiners in Theoretical and Practical Agriculture (Mr. W. McCracken and Mr. T. A. Dickson respectively) report as follows : "Although some of the candidates have done very fairly well, we must confess to a feeling of disappointment at the standard reached in this subject by the candidates as a whole. Many of the candidates showed a good practical knowledge of one particular branch of the subject, but those who were strong in dairying were weak in arable farming and *vice versâ*, although it should be added that with certain set operations most of the candidates showed a satisfactory acquaintance. Very hazy notions exist as to the course of procedure adopted when a change of tenants takes place on a farm. Drainage was weak, and extravagant ideas as to cost were entertained in many instances. Few of the candidates possessed proper knowledge of the correct dimensions for farm buildings, and few were able to draw an intelligible plan. Speaking generally, we may say that much ignorance prevailed as to the current prices obtainable for many of the products of the farm, *e.g.*, Wheat, Barley, Oats ; but we are glad to be able to report a great improvement in the recognition of feeding stuffs and the seeds of cereals, forage crops and grasses. Although, as we have said above, many of the candidates showed a satisfactory acquaintance with certain set operations upon the farm, when such operations had to be harmonised with a year's working of the farm the result was not so satisfactory, and in our opinion if another year's close attention to the farm and the work upon it had been given, the result would have appeared in a more thorough acquaintance with the principles and practice of Agriculture."

6. The Examiner in General Chemistry (Professor Liveing, F.R.S.) expresses disappointment with the average of the work done

this year in General Chemistry. He says that "In many cases the knowledge displayed is not good either in quality or quantity, and seems to have been acquired more for examination purposes than for practical use. Perhaps one-third of the candidates deserve rejection on this score. On the other hand, a few, some six or eight, show a very satisfactory acquaintance with the subject, and the rest have done passably, though not brilliantly."

7. The Examiner in Agricultural Chemistry (Dr. J. Augustus Voelcker, M.A., B.Sc.) reports that, as far as the subject of agricultural chemistry is concerned, he considers the results of this examination decidedly satisfactory. Of the 42 papers sent in, 7 were distinctly good, 12 papers receiving two-thirds or more of the total marks; 31 candidates in all passed, obtaining half marks or more, and 11 failed, 3 only of these being hopelessly bad. Of the different questions those not satisfactorily answered were (1) that relating to cotton and the preparation of cotton cake; (2) that on Peruvian guano. This would seem to show that attention had been given more to theoretical and "book-work" questions than to points more immediately concerned with practice.

8. The Examiner in Book-keeping (Mr. J. F. Bond, of Messrs. Welton, Jones & Co.) reports that "the work of the candidates generally is very unsatisfactory. It is almost inconceivable that any candidate could have failed who had previously worked out correctly any one of the papers published in the Journal during the past few years. No candidate succeeded in producing both balance sheet and profit and loss account with correct results; only three stated the account of the loan and interest correctly, and three included the cash in hand among the liabilities."

9. The Examiner in Mensuration and Land Surveying (Mr. A. T. Walmisley, M. Inst. C. E.) reports that of the 42 candidates who presented themselves, 24 displayed fair ability. "In the *vivâ voce* examination, half of the 42 candidates evinced a practical acquaintance with the adjustments of a theodolite and a dumpy level, but showed, as confirmed by the written examination, that their experience in setting out the base lines for a survey was at present limited to small areas, rather than extended to a combination of several contiguous enclosures. Eighteen of the candidates had evidently very little experience with optical instruments, but nevertheless understood the chain and the ordinary book-work connected with mensuration. Six candidates knew scarcely anything of either mensuration or field work."

10. The Examiner in Agricultural Engineering (Mr. F. S. Courtney, M. Inst. C.E.) reports that three candidates did very well, and their replies showed that they were conversant with the questions they were dealing with. As a whole, however, the results of the Examination did not meet his anticipations. The more practical questions were, as a rule, avoided. The sketching, where attempted, was with one exception most crude, and should certainly receive

more attention. In the replies to questions requiring anything in the way of description, there was generally an incompleteness which arose either from carelessness or want of knowledge. In the *vivâ voce* examination, the results were as a whole satisfactory amongst the candidates who qualified.

11. In the optional subjects, the Examiner in Geology (Professor Rupert Jones, F.R.S.) reports that the results of the Examination are very satisfactory, and that, compared with past years, there is now an evident improvement shown by the candidates in the knowledge of geology. The Examiner in Veterinary Science (Professor Sir George Brown, C.B) reports that the majority of the candidates acquitted themselves exceedingly well both in the written and oral examinations. The Examiner in Agricultural Entomology (Mr. Cecil Warburton, M.A.) reports that the papers on the whole gave evidence of good teaching in this subject. Out of forty-one candidates only six failed, while four obtained 90 per cent. of the maximum marks. The question on the warble fly was especially well answered.

12. In the Society's Agricultural Examinations of recent years, the number of candidates has annually increased, but the proportion of successful candidates to the number of competitors has diminished. Thus, the number of candidates this year is again larger than on any previous occasion, whilst the proportion of successes is 57 per cent., as compared with 61 per cent. in 1897, 64 per cent. in 1896, and 71·4 per cent. in 1895.

MORETON,
Chairman.

May 24, 1898.

EXAMINATION IN AGRICULTURE.

MAXIMUM NUMBER OF MARKS FOR THIS SUBJECT, INCLUDING THE *VIVÂ VOCE*, 300. PASS NUMBER, 150.

PART A. AGRICULTURE AS TAUGHT IN THE CLASS-ROOM.

(*Time allowed, three hours.*)

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1. With respect to a farm of 600 acres, not less than half of which is arable: (*a*) Describe the soil and situation of the farm you select, and explain shortly the system of farming you intend to practise, stating the acreage under each kind of crop. (*b*) Make out a statement of the kinds, quantities, and costs of the seeds and manures required for each crop; and estimate the probable yield and current value of each kind of saleable produce.

2. What are the special tillage requirements of the crops you have named? Give an account of the cultivations by which you would endeavour to secure the most favourable conditions for each.

3. You have undertaken to restore to a profitable condition, without breaking up the turf, an old pasture field with a heavy loam soil, which has been "run down" by constant mowing without manuring: Detail the steps you would take to attain the end in view, and estimate the cost per acre.

4. By what indications would you recognise the need for drainage in the case of an old pasture field with a retentive soil? Assuming that you drain such a field, ten acres in extent, what are the considerations which would

influence you in deciding upon the depth of the drains, and their distance apart, the size of the pipes used, and the time of the year at which you would have the work done? State in detail the approximate cost per acre.

5. Having entered into a contract for the supply of fifty imperial gallons of milk per diem: (*a*) How many cows would you require to keep, in order to maintain the supply and provide for the rearing of calves to make good the regular drafts of aged and unsatisfactory animals? (*b*) Divide the year into four periods, and state the price per imperial gallon you would expect to obtain for each period. (*c*) Compare as to financial and other aspects the sale of the milk with the production of butter, and of cheese.

6. Write an account of the feeding and general treatment of a heifer from birth until it has had its first calf.

7. Draw a plan and elevations for a set of piggeries for the accommodation of two breeding sows and twenty fattening pigs; note all the principal measurements; and specify the kinds of materials to be used. Explain the drainage, and the after-treatment of the liquid manure.

8. Write a short account of the planting and management of quick-thorn hedges, adding particulars of the cost.

EXAMINATION IN AGRICULTURE.

MAXIMUM NUMBER OF MARKS FOR THIS SUBJECT, INCLUDING THE *VIVÂ VOCE*, 300. PASS NUMBER, 150.

PART B. AGRICULTURE AS ACQUIRED BY PRACTICAL EXPERIENCE IN THE FIELD.

(*Time allowed, three hours.*)

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1. Give the amount of capital required for a farm of 500 acres, situated five miles from a town and station: 150 acres grass, of which 50 acres are good feeding land, 350 acres arable; all the arable land carrying sheep in winter on turnips.

2. Show, in as much detail as time will allow, how you would apportion your capital, and give the approximate income and expenditure of your first year's operations.

3. What time of the year would you select to take such a farm as the above? Give reasons for your preference.

4. How would you deal with the labour required on the farm on the supposition that efficient labour was scarce in the district? State the number of labourers you would employ, with the weekly wages given in each case, and also whether you would encourage piece-work, and if so, for what operations.

5. Give in detail the cost of harvesting and marketing under favourable conditions a $4\frac{1}{2}$ quarter crop of wheat, fairly long in the straw, from a 20 acre field about half a mile from the homestead. State the number of men, horses, &c., you would employ in the different operations. The delivery of the corn being at the town five miles away.

6. What class of sheep would you keep, and why? Sketch briefly how you would treat the flock so as to make the most of the produce.

7. What roots should be grown on such a farm? State the amount of seed per acre, the times of sowing, and how you would utilise the crops to the best advantage. What, in your opinion, is the principal advantage of growing roots?

8. How would you manage your cart-horses so as to obtain the maximum of work at the minimum of cost, the preservation of health being the first essential? Give the cost of keeping a horse per week in March and in July.

9. Enumerate some of the necessary operations on the farm, which cannot fairly be charged against any particular crop or variety of stock.

10. State how the men and horses would probably have been employed on such a farm as the above, say, during the last week of January of the present year.

EXAMINATION IN CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

PART A. GENERAL CHEMISTRY.

(Time allowed, three hours.)

1. State the chief causes which tend to keep the composition of the atmosphere, except as to aqueous vapour, constant at all times and places. Is the proportion of aqueous vapour in the air usually greater in winter or in summer, and what is the reason for this?

2. Describe in detail how to proceed in order to obtain a solution of ammonia in water from the sulphate. Also how to prepare a solution of such strength that each cubic centimetre of it shall be equivalent to a cubic centimetre of a solution of sulphuric acid containing one molecular weight in grams of sulphuric acid to each litre.

3. Explain the chemical changes which occur when (1) charcoal, (2) sulphur, are completely burnt in air; and give an account of the chief properties of the substances produced by the burning, in each case.

4. Give an account of the occurrence in nature of nitrogen, and of the circumstances in which nitrogen will combine with oxygen.

5. Explain the relations between caustic potash, potassium carbonate, and potassium bicarbonate. Also the chemical action of caustic potash with (1) chlorine, (2) sulphuretted hydrogen, (3) copper sulphate, (4) fat.

6. Describe the principal properties of silica. Which of its compounds are soluble in water; and what is the general composition of ordinary window and bottle glass?

7. What are the general differences in appearance, and properties, between ferrous and ferric compounds? How may ferric chloride be converted into ferrous? Show that the chemical reactions of ferrous salts would lead us to expect that ferrous salts would be antiseptic.

8. State the relation between cane and grape sugars. Give an account of the production of sugar from malt, and from unmalted grain mixed with malt, in mashing. How can you distinguish grape from cane sugar?

9. Explain how glycerin is obtained, and in what respects it is said to resemble an alcohol.

N : O : S=14 : 16 : 32

EXAMINATION IN CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

PART B. AGRICULTURAL CHEMISTRY.

(Time allowed, three hours.)

1. In what respects may an analysis of soil give useful information as to the fertility or otherwise of the same? What are the constituents to which one would chiefly look in estimating this? What circumstances may interfere to prevent the figures given in an analysis from being fully an index of the productive capacity of the land?

2. From what causes may sterility of soils proceed? Describe generally in each case how the evil may be remedied.

3. What is Peruvian guano, and where is it found? In what way may the occurrence of different kinds and qualities of Peruvian guano now on the

market be accounted for? In what respects of chemical composition and combination is Peruvian guano dissimilar to other manurial agents in common use?

4. Describe the "permanganate" test for the "organic purity" of water, and show the fallacy that underlies the application of this, or, indeed, of any test for the determination of a single constituent in an analysis of water, as a proof, by itself, of the purity or otherwise of the same.

5. State generally the influence which the principal chemical constituents of food respectively have on the quantity and the quality of the milk of cows.

6. Where is the cotton crop grown? How is the seed obtained, and how is it employed in the manufacture of (*a*) Undecorticated Cotton Cake, (*b*) Decorticated Cotton Cake? What are the principal differences, alike of composition and of respective use, of the two classes of cake? To what objections are the two cakes, through imperfect manufacture, at times open?

7. What do you understand by the term "digestive coefficient" as applied to foods? Compare, generally, the digestive power for the different constituents of food possessed respectively by ruminant animals, by horses, and by pigs.

EXAMINATION IN BOOK-KEEPING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

(*Time allowed, three hours.*)

Journalise the following transactions, post them into a ledger, make out a Balance Sheet and a Profit and Loss Account.

To lessen the number of entries in the ledger, the single heading "Live Stock" may comprise all the animals except horses; single entries may also be used for "Rent, Rates, Taxes, and Insurance," for "Seeds, Manures, and Foods Purchased," for "Tradesmen's Bills and Petty Cash," and for "Corn, Hay, and Straw."

John Brown borrows from his father 3,000*l.* at $3\frac{1}{2}$ per cent. per annum.

He rents a farm at 300*l.* a year from Sept. 29, 1896, and pays valuations for—

	£	s.	d.
Horses	105	0	0
Pigs	55	0	0
Poultry	6	0	0
Hay and Straw	350	0	0
Corn	40	0	0
Growing Crops and Tillages	500	0	0
Manures	45	0	0
He deposits in the Bank	1809	0	0
He draws cheques during the year for:			
Wages	540	7	6
Rent	65	0	0
Rates, Taxes, and Insurance	65	1	3
Petty Cash	28	0	0
Implements	240	5	0
Seeds and Manures	153	4	2
Horses	180	0	0
Cattle	410	0	0
Sheep	450	0	0
Pigs	23	8	0
Tradesmen's bills	72	4	6
House expenses	87	3	2
Cattle Food purchased	78	10	0

	£	s.	d.
He receives and pays into the Bank for—			
Corn sold	130	0	0
Sheep	145	0	0
Milk and Butter	75	6	0
Pigs	34	7	6
Eggs and Poultry	7	0	0
Wool	70	8	0
He sells to Thompson 10 cows at 16*l.* each, and receives from him on account	100	0	0
He sells to his landlord 40 loads of hay at 4*l.*			
On Sept. 29, 1897, his Valuations are—			
Cattle unsold	425	0	0
Sheep	380	0	0
Pigs	70	7	6
Poultry	9	4	0
Horses	260	0	0
Corn	840	0	0
Hay and Straw unsold	345	0	0
Growing Crops and Tillages	575	0	0
Food Purchased	52	12	0
Seeds and Manures	85	0	0
Petty Cash in hand	4	3	6

Implements at cost price less 10 per cent. per annum for depreciation.
He owes to Tradesmen 47*l.* 4*s.* 9*d.*

EXAMINATION IN MENSURATION AND LAND SURVEYING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

(*Time allowed, three hours.*)

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1. On the plan[1] given upon page 4 of this paper draw in pencil the base lines you would run to enable you to make and subsequently to plot a complete survey without the aid of angular instruments.

NOTE.—*The Candidate must not spend more than twenty minutes over this question.*

2. Compute the area of the enclosure marked A upon the plan[1] shown on page 4 of this paper, using the ordinary plotting scale, and expressing the result in acres, roods, and perches.

3. Make up the level book[1] upon page 2, filling in the columns of rise and fall with reduced levels of height above base, and show how the accuracy of the calculation or reduction of levels may be proved to be free from clerical error.

4. Plot the section in the last question to a scale of three chains to one inch horizontal, and 30 feet to one inch vertical.

5. Illustrate and describe a method of determining (1) the distance in plan, and (2) the elevation of an inaccessible point, such as the top of a tower situated in open country, relatively to which point you have convenient space both for suitable measurements and observations.

6. A well six feet internal diameter is sunk to a depth of 50 feet with a lining of 14 inches brickwork. How many cubic yards of excavation are required, disregarding allowances for timbering, &c., and how many rods of brickwork are employed?

7. If a pipe whose diameter is $1\frac{1}{2}$ inches fills a cistern in five hours, in what time will another whose diameter is $3\frac{1}{2}$ inches fill the same?

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[1] Not reproduced here.

8. In the case of a garden 300 feet long, 180 feet broad, in which it is desired to have a gravel walk placed lengthways in the centre so as to occupy one-eighth of the area of the garden, how wide should the path be?

9. Find the solid contents of a stone, the height being 20 feet, the ends being rectangles, the length and breadth of the one being 14 and 12 inches respectively, and the corresponding sides of the other 8 and 6 inches respectively.

10. From the field notes[1] given upon page 3, lay down the survey lines and plot the details to a scale of three chains to one inch.

NOTE.—*The Candidate must not spend more than forty-five minutes over this question.*

EXAMINATION IN AGRICULTURAL ENGINEERING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

(*Time allowed, three hours.*)

N.B.—Not more than half the questions should be attempted.

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1. Explain what is meant by the term "gravity."

2. State the principles upon which a steelyard is constructed, and illustrate same by sketch.

3. Define the term "Horse power" as a mechanical measure of power.

4. An engine fly wheel 5 feet in diameter runs at 150 revolutions per minute; it is desired to drive 2 lines of shafting from it by pulleys and belting, one line of shafting to run at 320 revolutions per minute, the other at 500 revolutions. Give dimensions of pulleys and rough sketch of method of driving.

5. Describe the parts of a steam engine indicator, and describe its action.

6. Given a set of 2 and 3 sheaved blocks and the necessary rope fall, what load could one man lift when exercising a pull of 80 lbs. on the rope?

7. What do you understand by the term "Otto Cycle" as applied to gas engines?

8. Describe the working of a gas engine, accounting for what takes place at each forward and backward stroke of the piston.

9. Enumerate the several mountings on a steam boiler.

10. Describe the various portions and the motions of a chaff-cutter.

11. A pail is 1 foot 6 inches deep, 12 inches diameter at top, and 10 inches at bottom, what quantity of water will it hold?

12. What is the weight of a gallon of water?

13. What is a safe load per square foot for brickwork built of sound stock bricks set in Portland cement mortar?

14. Sketch a wooden king post principal for a light barn roof 20 foot span, giving dimensions of the several parts.

15. Upon what principle is a thermometer constructed? and describe the method of its construction.

16. Convert 60° F. into its equivalent in Centigrade, and explain the formula for such conversion.

17. State what you consider the best method of measuring the flow of water in a stream, and describe its application.

18. Describe the centrifugal cream separator, and illustrate the leading parts by sketches, and explanations.

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[1] Not reproduced here.

EXAMINATION IN BOTANY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

(*Time allowed, two hours.*)

Seven questions at least must be answered.

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1. What is the function of the leaf? Describe the structure of the stomata and their functional relation to the interior cells of the leaf.
2. What organs are employed by plants to store up food? Give examples.
3. What are bacteria? How do they affect plants and animals?
4. What do you mean by albumen in seeds? Mention two seeds in which albumen is present, and two which are destitute of it.
5. Specify some of the methods by which ripe seeds are scattered to a distance from the parent plant.
6. What differences exist among seeds as to the length of time they retain their vitality? Give examples, and explain the reasons of the differences.
7. What are the principal sources of the food of a plant, and how does it benefit from manures?
8. Give a short history of the life of Ergot.
9. Give the principal characters of the Natural Order Umbelliferæ, and specify the plants of this Order that are cultivated for food in England.
10. Name the plants marked A and B, and give a systematic description of each.

EXAMINATION IN GEOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

(*Time allowed, three hours.*)

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1. Explain the nature and conditions of (1) a Natural Spring, and (2) an Artesian Well. Why should the water of either of these be "hard" and rain-water be "soft"?
2. What lithological and paleontological characters of Strata are especially taken into consideration in studying the original limits of (1) *Marine*, and (2) *Fresh-water* Formations?
3. Name any particular Fossils that supply the evidence for the former existence of Sub-classes and Orders of the *Crustacea*.
4. Indicate the oldest known fossil *plant*, *trilobite*, *fish*, *reptile*, and *mammal*.
5. Enumerate the chief *metallic ores* found in the British Islands. Give particulars as to their nature, localities, and modes of occurrence.
6. In relation to Glaciers and the Glacial Drift, define *moraines*, *drumlins*, *kames*, *eskers*, *roches moutonnees*, *blocs perchés*, *pot-holes*, and *striæ*.
7. If, for the breadth of a mile, Strata dip at an angle of 55°, how would you measure the *vertical thickness* of these strata as originally laid down?
8. Make a classification of Rocks (1) according to their Modes of Origin; and (2) according to their Component Minerals.
9. Describe the formation of Peat. Where does it occur?
10. Mention the economic uses of *clays*, *loams*, *marls*, *shales*, *slates*, *common limestone*, *dolomite*, *chalk*, and *oolite*.
11. What is the origin of Soils? Why are they sometimes similar to, and sometimes different from, the underlying Rocks?
12. Name and describe *four* of the Specimens on the table.

EXAMINATION IN VETERINARY SCIENCE.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

(Time allowed, two hours.)

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1. Give the names only of all the organs and parts of organs comprised in the digestive system—for example, lips, tongue, teeth, &c.—from the mouth to the rectum.
2. Describe the function of rumination, and state to which compartment of the stomach the re-masticated food passes.
3. In what way are the fœtal membranes attached to the lining of the uterus in the mare and cow?
4. Describe the connection which exists between the circulatory system of the fœtus and that of the mother in the mammalia.
5. How is the function of respiration performed in the fœtus?
6. Describe the situation and give the scientific name of the organ which is called sweetbread.
7. Describe the dentition of the following animals at the periods named: *i.e.* horse at 4 years, ox at 3 years, sheep at 2 years, and pig at 10 months.

EXAMINATION IN AGRICULTURAL ENTOMOLOGY.

MAXIMUM NUMBER OF MARKS, 100. PASS NUMBER, 50.

(Time allowed, one hour.)

Candidates will not be required to answer more than FIVE of the questions on this paper. The replies are to be as short as possible, and where the candidate is not acquainted with the scientific name of an insect, the generally received English name will be accepted.

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1. Describe the mouth-parts of a biting insect, and give some account of the breathing apparatus of *Insecta*.
2. Name the various two-winged flies (*Diptera*) which are injurious to corn crops, indicating the crops they specially affect, and the measures in each case calculated to prevent a recurrence of the attack.
3. Give a full account of three omnivorous root-feeding insects.
4. What insect pests attack—
   (*a*) Fruit trees in general.
   (*b*) Apple trees in particular.
   Briefly indicate methods of treatment.
5. To what insect attacks are asparagus and celery respectively liable? Give the nature of injury, and suggest a method of treatment in each case.
6. Give the full life-history of the "warble-fly" (*Hypoderma bovis*), and point out clearly the extent of the damage done by it.
7. What are the particular objects in view when the following substances are used as insecticides; (1) Soft soap, (2) Paris green, (3) Spirit of tar?
8. Explain the connection between "tulip-root" in oats and one form of "clover-sickness."

Notes, Communications, and Reviews.

THE MICROBE OF PLEURO-PNEUMONIA.

For many years the bacteriological methods which have sufficed to reveal the germs of a considerable number of the contagious diseases have been applied to the lesions of pleuro-pneumonia, but with uniformly unsuccessful results. No one at the present day doubts that in the case of every contagious and infectious disease a living germ is at work, and is equally responsible for the progress of the disease in the sick animal and for the spread of the disease from one animal to another. It has long been known that the liquid which saturates the inflamed portion of lung in pleuro-pneumonia is capable of setting up a precisely similar inflammatory process in the subcutaneous connective tissue when it is injected into an experimental animal, and for this purpose even a small quantity of liquid from a diseased lung suffices. This liquid, it was felt, must therefore contain the germs of pleuro-pneumonia, probably in considerable numbers, and yet they could neither be directly detected in it with the microscope nor cultivated from it in any of the artificial substances which serve as a quite appropriate soil for the growth of such germs as those of anthrax, glanders, or tuberculosis. At last, however, MM. Nocard and Roux [1] appear to have solved the problem, and their success is mainly due to the adoption of a method of cultivation which very closely assimilates the artificial to the natural.

When natural products, such as pus, blood, or inflammatory liquid, containing disease germs, are introduced into the tissues of a susceptible animal, these germs begin to multiply at the place where they were introduced, but this method of experimentation affords little or no assistance in the search for the disease germ if that was not detectable in the material used for inoculation. As the disease develops where the material used for inoculation was introduced, we have the most confident conviction that the germs are multiplying there, but when we come to explore the inflamed tissues they escape our observation, because of their small size and of their being concealed by tissue elements with which they are

[1] *Annales de l'Institut Pasteur*, vol. xii., p. 240.

mixed up. About two years ago MM. Metchnikoff, Roux, and Salimbeni, in carrying out some researches on cholera, had recourse to a method which enabled them to cultivate the organisms in the body of a living animal, but in a liquid protected from invasion by those wandering cells which in ordinary methods of inoculation generally flock to the place where the germs are growing. These wandering cells have the double disadvantage of interfering with the multiplication of the germs and of concealing them from view when attempts are made to discover them with the microscope. The authors mentioned employed little capsules of collodion filled with a sterile nutrient clear liquid (the ordinary *bôuillon* of the bacteriological laboratory). After adding to the liquid in the capsule a little of the material containing the germs (to serve as seed), the aperture was carefully closed, and the capsule thus sealed was introduced into the abdominal cavity of a living animal and left there for a period of days, months, or weeks.

Across the wall of such a capsule the imprisoned microbes cannot pass in the outward direction, nor can the leucocytes or other animal cells which are attracted by the microbes pass through it in the opposite direction. Nevertheless the collodion film is not a barrier to the diffusion of liquids, and hence it happens that by interchanges through the wall of the capsule its contained liquid gradually becomes assimilated in composition to the natural lymph, and the germs thus find themselves, in respect of nutriment, just as favourably circumstanced as if they were growing freely in the tissues. Moreover, those excrementitious products which the bacteria themselves manufacture, and which tend to hamper or arrest their growth, also diffuse out of the collodion capsule, and never reach that degree of concentration which would be hurtful to them. In short, it may be said that the same method if applied to pisciculture would consist in breeding fish in their natural habitat in a net with meshes too small to allow them to pass out, and yet large enough to permit of their food materials passing in.

MM. Nocard and Roux introduced such collodion capsules, previously inoculated with a trace of liquid from a pleuro-pneumonia lung, into the abdominal cavity of rabbits, and left them there for fifteen to twenty days. When they were removed it was found that their contained liquid, originally quite clear and transparent, was now slightly albuminous and opalescent. Under the microscope it showed no cells, but with a magnification of about 2,000 diameters an infinite number of small refractile moving points could be made out. A similar collodion capsule filled with the same nutrient liquid, but not inoculated with the virus from a pleuro-pneumonia lung, was found, after a sojourn in the abdominal cavity, to be quite transparent, and devoid of any of those moving particles. That the moving particles were really living things was proved by ascertaining that a trace of liquid containing them from the first capsule could be used as the seed material for a second, which, after a sojourn in the abdominal cavity, again showed an infinite number of moving particles in its liquid. If, however, the liquid containing

these particles was heated so as to kill them, and then used as a seed material to another capsule, the latter remained quite clear and transparent after incubation in the abdominal cavity of a rabbit.

The proof that the germ of pleuro-pneumonia multiplies in the liquid of these collodion capsules and that the minute refractile mobile particles are the actual germs themselves, rests on the results of certain inoculation experiments on cows. The liquid from a pleuro-pneumonia lung when injected under the skin of the body of an animal of the ox species is capable of setting up a lesion which is always serious and often fatal. MM. Nocard and Roux found that the contents of the inoculated capsules had the same effects. Five cows were thus inoculated, with the result that more or less formidable swellings formed at the seat of inoculation in all the animals, and one of them succumbed. Three of the survivors were afterwards inoculated with virus from a pleuro-pneumonia lung, and experienced no bad effects, thus showing that the first operation had left them protected against pleuro-pneumonia, and furnishing another link in the chain of proof that the refractile moving particles in the incubated capsules were the actual germs of the disease. The authors are unable to give any information regarding the form of the germs, as even the highest powers of the microscope scarcely do more than make them visible. It is interesting, however, to know that, besides cultivating the germ in the manner already described, they also succeeded in growing it outside the body in test-tubes, the artificial medium employed being a solution of peptone to which a small proportion of serum of the blood of a cow or a rabbit had been added.

A great interest attaches to these researches because of the hope which they hold out that the application of similar methods will make us acquainted with the hitherto unknown germs of other equally important diseases; and in this connection it may be noted as a singular fact, that the germs of all the most intensely infectious diseases of man and animals, such as smallpox, measles, cattle-plague, and foot-and-mouth disease, are still unknown.

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HINTS TO YOUNG VALUERS.

Nothing shows the altered relations between landlord and tenant that have come about within the last half-century, and the introduction of arrangements of greater precision between the two parties, more forcibly than the publication of such a work [1] as "Hints to Young Valuers," in which "the different methods of valuing are

[1] *Hints to Young Valuers: a Practical Treatise on the Valuation of Property*; By A. R. Cragg, F.G.S., and J. R. V. Marchant, M.A., Barrister-at-Law. London: The Land Agents' Record, Limited. 1897.

discussed in detail" and "questions arising upon changes of tenancy of farms and other properties, and upon the valuation of landed estates" and their equipment "are dealt with at length."

The legal portion will be found to contain the most important principles which govern valuations or bear on a valuer's business, while the appendix embraces the full text of four remarkable recent Acts of Parliament which have disquieted the status of landlord and tenant respectively, and within the period of twelve years (1883 to 1895) have so materially contributed to the security of the tenant's capital and the practical application and use of discoveries in the field of scientific research. The subjects dealt with by the authors go far beyond those that are simply rural, embracing information on Copyholds, Town Properties, Fixtures, Goodwill, Building Land, Quarries, Mines, Collieries, Compensation, Conduct of Arbitrations, Insurance, and the Death Duties. There are forty-six chapters in all, every line of which bears testimony to the care and ability with which they have been written, while the whole work is excellent in its conception and tone, and displays the prudence and moderation no less than the assiduous study and conspicuous ability of the authors, who, while clearly setting out the law and the practice relating to valuations, tenancies, and tenant right, and indicating the responsibilities and obligations imposed by custom or established by modern legislation, repeatedly urge the necessity of greater attention being bestowed on these points, with the express view of avoiding legal controversy and unpleasant differences during the continuance of a lease, and more especially at its termination. The authors give it as of their experience "that it is a rare occasion for a valuation to be settled without a claim being made by the landlord or the incomer on his behalf for dilapidations of some sort, and it is equally rare for such items to be settled amicably. It is a common knowledge that tenants sign leases containing restrictive clauses as to cropping, and including conditions as to repairs and maintenance of the buildings (and, it may be added, other farm equipments such as drains, gates, and fences), without realising their full force and significance, or if they do, they invariably fail to pay any attention to them *until* the end of the tenancy." And yet dilapidations in agricultural tenancies include injury to the land and fences, removal of hay, straw, dung, roots, mowing of pasture land, cross cropping, foul land, permitting the growth of thistles and docks on grass land.

This short review should of course be confined to the rural portion of the work, which will be found to be pretty well brought together in separate chapters, though some points are dealt with in other chapters which have a bearing on the management and control of urban holdings and property.

The title is somewhat misleading, resulting possibly from the modesty of the authors; the truth being that there is more of strong meat for adults than of milk for babes in these "Hints." "A Valuer's Manual for Owners and Tenants of Land and other Property" would better express the scope and purpose of the book. On consideration of the variety of character and acquirements of the host of

valuers whose services are at the command of outgoing and frequently impecunious tenants, it must be evident that there is undeniable need for study and education among the elder members of the class that have adopted this calling as a source of income.

The old habit of lumping the amount of a valuation in one sum gives an opportunity for the mere superficial practitioner to exercise his "art and mystery" of valuing. There might be natural aptitude and solemn carriage, but if he is to be paid for, and held responsible for, the opinion he gives, he must have had special training and devoted some years to painstaking study of the business.

The nineteenth section of the Agricultural Holding Act, 46 & 47 Vict. c. 61, now makes practical knowledge, accuracy, and precision indispensable, for it provides that the award under the Act shall not assign a sum *generally* for compensation, but shall, so far as possible, specify the *several* improvements, acts, and things in respect whereof compensation is awarded, and the several matters and things taken into account (under the Act) in reduction or augmentation of such compensation; the time at which *each* improvement, act, or thing was executed, committed, or permitted, as well as the sum awarded in respect of *each* improvement, act, matter, and thing.

By no consent of the referees nor by any action of the umpire can this provision be set aside. If it is, the award is not a valid award, and a settlement concluded under it would be hereafter revocable by law. The authors, however, point out that these provisions are only required for the valuation of improvements scheduled in the Act, and do not extend to valuation of tillages. The remarks on "Dilapidations" are well worth attention, as also the example given of the detailed method of valuing them as a set-off to a tenant's claim.

Their opinions, too, of the Act are evidently not over favourable, and experience has already done much to justify their distrust. They describe the Act as limited in scope and cumbersome in its machinery, and with great good sense point out the advantage it is for all parties to make a previous agreement in writing, providing for compensation for matters outside the Act, and in substitution for compensation under the Act; or, if such an agreement is out of the question, then to refer all claims between the parties to a referee without making use of the cumbersome machinery of the Act. In such a procedure the award of the referee would be good even if it did not comply with the nineteenth section of the Act.

The fifth chapter is devoted to the subject of gates and fences. Dirty and crooked blinds and an untidy woman go hand in hand. "So it is with fences. A slovenly farmer and a neglectful landlord are invariably shown up in the hedgerows." Following on this dictum, the authors point out the serious consequences of inattention to this matter, and the great outlays for fencing and gates arising on change of tenancies. One valuation is mentioned by way of caution, in which fencing dilapidation was referred to an umpire who awarded 5*l*. to the landlord and incomer. The cost, however, of putting the hedges to rights came to over 156*l*. This chapter proceeds,

ere it closes, to give the details of outlay for the resuscitation of worn-out or neglected fences under the various items.

The dimensions and finish of gates of different sorts are minutely stated, with their cost; so of hanging and shutting posts—of the ironwork, of wicket gates, stiles, fencing of all sorts, ditching, hedges, stone walls, planting new fences, and rearing them, and the cost of iron fencing. Anyone who reads the five pages comprised in this chapter will be able to form some idea of the exhaustive way in which the authors have treated every subject which they have taken in hand, of which the following are of general interest as well as of primary importance. Chapter II., Valuation for rent; III., Valuation for Sale; IX., The Occupier; X., Outgoings; XIV., Timber and Plantations; XIX., Farm Valuations, (1) for annual balance sheet, (2) a change of ownership of lands in hand, (3) between outgoing and in-coming tenants, (4) for succession duty and how practical knowledge of this class of work may be acquired—but with difficulty; XX., Copyholds; XXV., Dilapidations; XXVI., Fixtures; XL., Rating; XLII., The Conduct of an Arbitration; XLIV., The Legal Position of Valuers and Surveyors; and, last of all, Chapter XLVI., the Death Duties.

A comparison of this work with the earlier editions of Mr. Bayldon's "Valuation of Rent and Tillages" published in the first half of this century, and considered one of authority and excellent as a book of reference, throws a world of light on the subsequent changes in the processes and methods of rural management, the change of values, and the attitude of independence and assertion of personal interest, and claims on the part of the hirers of farms, market-gardens, and allotments.

After all, however, the portions of the "Hints" which may be expected to be taken up and studied by members of the Royal Agricultural Society are those which go into the question of compensation to tenants, sitting, outgoing, or incoming, for improvements in which they have a money interest. The reader will be at no loss to perceive the difficulties, some natural, some designed and artificial, that as a matter of valuation embarrass the question—difficulties which, when solved, are still much bewildered and imperilled by the intricacies of the law, common and statute, pertaining to agricultural contracts and agreements.

This result, however, may be expected to accompany the national practice of husbandry under the dual control of tenant and landlord, the one influenced by temporary considerations, the other by those of a more permanent nature, and where of necessity projects of an antagonistic complexion must perhaps insensibly play their part. It is in the face of this fact that the necessity of a clearer conception of the rights, duties, and responsibilities of the two co-operating parties become apparent, and nowhere can they be better furnished than from the storehouse of information to be found in the "Hints to Young Valuers."

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IMPORTED DAIRY PRODUCE.[1]

BUTTER.

THE Australasian Butter Season of 1897–98 is distinguished from all its predecessors by the unprecedentedly low prices which prevailed from its opening in October, right through November, December, January, and up to the third week in February; and also by the Victorian supply terminating abruptly in March instead of, as usual, gradually decreasing in volume until—along with other Australasian supplies—it altogether ceased in May or June. The low prices which were so characteristic a feature of the season were not confined to Australian and New Zealand butters, but prevailed for all other varieties, and were undoubtedly due to two main causes, the first being the large home production of butter during the summer, autumn, and winter of 1897, and the second, the dispute in the engineering trades, which specially affected for a long period the artisan classes, who are the largest consumers of imported butters. The home production in the year 1897 is estimated to have been close on 86,000 tons, which is 6,000 tons in excess of the estimated quantity made in the previous year, and 5,000 tons more than the average production of the five previous

TABLE I.—*Average Prices per cwt. of Australasian Butter, choicest quality, for the Season 1897–98, compared with the Average for the Four Previous Seasons.*

	Oct.		Nov.		Dec.		Jan.		Feb.		Mar.		Apr.		Season	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Average prices of seasons 1893–4 to 1896–7	115	10	111	1	110	1	108	9	103	0	100	0	93	6	106	0
Average price of season 1897–8	98	11	103	10	102	8	96	1	99	2	105	0	96	7	100	3
Increase (+) or Decrease (−) in 1897–8	−16	11	−7	3	−7	5	−12	8	−3	10	+5	0	+3	1	−5	9

years. It is difficult to estimate with any approach to accuracy the extent to which the purchasing power of the artisans was directly or indirectly curtailed owing to the great numbers who for months were thrown out of employment. While the dispute was in existence no one seemed to have any adequate idea of the effect it was having on the price of butter. It was only after the settlement came that this was made emphatically clear. From the end of January 1898, when work was resumed, a sudden rise in butter immediately developed, and by the beginning of March it reached the highest price of the season. Until the third week in February the prices for Australasian butter during the season 1897–98 were

[1] From Messrs. W. Weddel & Co.'s *Australasian Dairy Produce Review* (Season 1897–98).

continuously below those of any of the four preceding seasons, the result being that during the five months ending February, 1898, the average price was 9*s.* 8*d.* per cwt. below that of the four previous seasons for the same months. On the other hand, March and April showed an average of 4*s.* per cwt. above that of the same months in the four preceding years. Table I. brings out this point very clearly.

As before stated, all varieties of imported butter were affected by low prices in the season 1897–98, and instead of comparing these prices with the average of the four previous seasons, if the average values of French (fresh), Danish, and Australasian be compared with the average of the season 1896–97, the following shows the increases and decreases :—

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Season
	s. *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
French (fresh) . .	−16 9	−13 2	−11 2	−16 1	− 9 4	− 4 8	+ 0 11	−10 4
Danish	−17 2	− 2 4	− 3 6	− 8 11	+ 0 7	+ 4 1	+ 1 3	− 3 8
Australasian . .	−15 11	− 2 11	− 5 3	−11 3	− 2 4	+ 9 11	+ 2 8	− 3 7

These differences relate to the *London* prices of "Choicest" qualities, but the result would not vary to any appreciable extent if those of any other market were selected.

A third cause, which had some influence in reducing the prices of all classes of butter during the early part of the season, was the very great increase in the imports of butter which took place during the month of September. This augmentation was due to the action of the Copenhagen Committee, who, to the surprise of everybody in this country, and without any apparent reason, raised the price of Danish butter week by week from 92*s.* per cwt. on August 5, to 108*s.* on August 26. So great a rise in value in so short a time brought about an import of 14,500 tons of butter in September, or 1,574 tons in excess of the import in August. Nearly the whole of this excess was drawn from across the Atlantic, Canada sending an increase of 1,562 tons, and the United States of 770 tons, while Denmark sent 850 tons less. In October the import fell to 11,610 tons, and in November to 11,840 tons.

The great drought in Australia, which has continued more or less uninterruptedly for three successive seasons, has had a very disastrous effect upon the dairy industry in that part of the world, and very largely reduced the amount of butter which, under normal conditions, would have been produced. The greatest amount of butter which Australia ever exported to this country was in the season 1894–95, when 12,166 tons were shipped. The following season the export fell to 7,585 tons. In the season of 1896–97 the total export rose to 8,784 tons. During the season just completed, the Colony of Victoria has felt the drought most severely, and, compared with last season, her deficiency of export to the United Kingdom reaches the amount of 1,698 tons, and that of South Australia

62 tons. On the other hand, the import from New South Wales—including some Queensland butter—has increased by 619 tons; and Queensland, which, during the season 1896–97 exported only 64 tons of butter, has, during the season 1897–98, supplied nearly 400 tons, the exact amount not being ascertainable from our Customs returns, as part of it was shipped *viâ* Sydney, and is entered as from New South Wales, though the amount which came direct from Queensland was 288 tons. Thus the total export from Australia in the past season was 7,868 tons, or 916 tons less than in the previous season. New Zealand fortunately has not suffered so severely from drought as the sister Colonies have, and her steadily increasing contributions of butter, during the four past seasons, have been 2,305 tons, 2,558 tons, 3,088 tons, and 3,680 tons respectively.

The Colony that is making the greatest strides in sending dairy produce to this country is Canada, which during the year 1897 supplied the United Kingdom with 5,470 tons of colonial butter, an amount which was exceeded only by Victoria. Being in the northern hemisphere, the butter does not compete in any serious degree with the colonial butter from the southern hemisphere, because the seasons are alternate, but the high quality which much Canadian butter possessed last year made it a formidable rival to many of the Continental varieties in British markets; and European butters will find, in the near future, a severe competitor in the Canadian production. Cheap fertile virgin land, light taxes, and economic means of transit, are advantages which Canada possesses in a marked degree over the exhausted soils, high rents, and heavy taxes of many European butter-producing countries.

Quality and Condition.—The quality and condition of the Australasian butter which arrived during the past season shows an undoubted improvement over former years. It will be remembered [1] that in the previous season much of the butter sent from New South Wales showed signs of having been heated during the interval between its manufacture and its shipment at Sydney. During the past season this cause of deterioration has not existed, and the quality of New South Wales butter has made a further advance in public favour, and bids fair in a very short time to stand on an absolute equality with the butter from any of the sister Colonies. In the United Kingdom nothing has been found more effectual in removing the prejudices of buyers against the butter that New South Wales produces than the excellent quality which has been maintained all through the past season by the butter from the Berry Central Butter Factory. Several other factories have assisted in producing this beneficial result, but their butter has not possessed the same uniform superior quality which has characterised that produced on the Berry Estate. The butter from Victoria generally has not made any advance in quality over that of previous seasons, which may be attributed very largely to

[1] See Journal R.A.S.E., 3rd series, vol. viii., 1897, p. 537.

the abnormally hot weather which has prevailed so persistently in that Colony. There is one factory, however, which deserves special mention for the enterprise shown and success achieved. The Euroa Butter Factory has, by means of pasteurising its raw material, succeeded in producing a butter of considerably higher market value than that made without the aid of pasteurisation. The Colony, however, which has made most progress in improving the quality of its butter during the season just closed is New Zealand, and there are now several brands which for richness of flavour and excellence of manufacture are fully equal to any Australian. The great drawback to the more rapid advancement of the New Zealand butter trade is the want of regular and more frequent shipments. Queensland, the most tropical of the Australian Colonies, has during the last few months demonstrated the possibility of supplying the home markets with a butter which, though not yet equal to the best brands of the other Colonies, is nevertheless a very valuable addition to the supply. It is not to be expected that the butter factories of Queensland can, with the short experience they have had, and under the extreme difficulties of the climate in which they operate, turn out so good a butter as those older established factories in the more temperate parts of Australia that have had a very much longer experience.

Regular Supplies.—Though there is some improvement in the regularity with which butter has been arriving from the Australasian Colonies, the shipping arrangements are yet a long way from being perfect. Of all the produce exported from the Colonies nothing demands greater regularity in shipping than butter. All Continental butters which come into competition with Australasian are sent regularly to the British markets and arrive punctually to a day, thus securing to the shopkeeper a continuous supply of the brand he prefers, which is one of the surest means of the butter obtaining a good hold, and keeping possession of the trade. When, therefore, great irregularity exists in the intervals between arrivals, as well as great want of uniformity in the quantities shipped, it is not possible to secure such high average values as if these disadvantages did not exist. For instance, from December 31 to January 13, during the past season, there was no arrival of butter from either Australia or New Zealand, and then, on January 13 and 14, five vessels entered the London docks, bringing together over 68,000 boxes, or more than half the whole supply necessary for the United Kingdom for one week, thus inevitably causing a temporary glut, with its consequent fall in prices.

New Zealand, which labours under greater disadvantages than Australia, in respect of regularity of supply, has during the past season secured no improvement in this matter, though the shipping companies have made a great advance in the method of stowage. In previous seasons butter and cheese were often so stowed that it was many days after arrival before they could be landed; during the past season discharge has been so satisfactory that no complaints have been heard.

New South Wales suffers a great disadvantage regarding the stowage of butter, which could be easily remedied. As Sydney is the first loading port, the butter shipped there has generally been the last to be discharged in London, with the result that Victorian butter from the same ship often has the market to itself for one or two days. Consequently, when the New South Wales butter gets on the market buyers have mostly supplied their wants, and thus the number of purchasers is much restricted, as well as the demand greatly reduced, and lower prices are therefore made than if it came on the market at the same time as Victorian. When South Australia resumes exporting butter, New South Wales will suffer further disadvantages from an aggravation of the same cause. Either New South Wales butter should be stowed in a separate chamber, or so stowed by "piling" it that it can be discharged simultaneously with Victorian.

Australasian Butter Committee.—During the past season the circumstances connected with the "slump" in prices just before the Christmas market and again in the middle of January have emphasised more strongly than in any previous period the necessity for some organisation to prevent the great fluctuations in price which take place in Australian and New Zealand butter, and which do not appear to be brought about by either the usual influences of supply and demand or by other exigencies of the market. Among the agents who sell Australian and New Zealand butter in the United Kingdom there is not that cohesion and solidarity of action which is essential to secure prices consonant with both the intrinsic merit of the article and its marketable value at any particular period. Nearly every description of butter imported into the United Kingdom from the Continent of Europe is controlled more or less as to its selling price by some committee or organisation, either established in the country where the butter is made or in this country where it is sold. If these organisations have been found essential to protect the various interests which are engaged in the butter trades of countries lying close to the markets of the United Kingdom, how much more necessary must they be in the case of Australia and New Zealand, which lie on the other side of the world, and which are twelve thousand miles away from the markets where their produce is offered for sale! There being no unity of action among the sellers, buyers have found by experience that the agents take different views of values, and therefore they visit seller after seller more in the search of those who are willing to take lower prices, than for the purpose of purchasing the particular variety or quality of butter which they require. If the result of the existing method were confined solely to these particular cheap sellers then no great harm would be done, for shippers would soon discover these firms and avoid consigning to them; but unfortunately the cheap sellers know that if they reduce their prices to-day all their fellow agents will have to fall into line with them to-morrow, and thus they escape detection, as it is impossible under the existing condition of things for those in the

Colonies to detect which were the particular agents that broke the market.

Colonial and Foreign Imports.—The extraordinary capacity of British markets for absorbing the enormous amount of imported butter is demonstrated by the fact that during 1897 the weekly import averaged more than 3,000 tons, the total for the year being 160,890 tons, which was an increase of 9,000 tons over 1896. In addition to this it is estimated that the home production for the year increased by 6,000 tons, thus showing a supply of 15,000 tons in excess of 1896. Of the increased import of butter in 1897 it is very gratifying to note that 3,600 tons came from British Colonies, Australia in this respect showing an improvement of 1,529 tons, Canada 1,052 and New Zealand 1,007 tons, the total import from the Colonies being 19,014 tons against 15,426 in 1896.

Turning to the import from foreign countries, one of the most notable features is the falling-off in the import of German butter during the last four years. In 1893 the import was 8,258 tons, while last year it fell to 2,588 tons. This decline is continuing, for in the first four months of 1898 the import is 525 tons less than in the same period of 1897. It thus appears as if Germany, in the near future, would cease to export butter to this country. Belgium, France, and Germany now all send less than they did in 1890. On the other hand the increase from Denmark since 1890 is considerably more than the total import of colonial butter in 1897. Russia also is outstripping Australia in its rate of growth, the import from that country last year being 9,517 tons more than in 1890, while Australia showed an increase of but 8,932 tons in the same period.

Table II. shows at one view the home production, the colonial and foreign import, and the consumption of butter per head of the population for each of the last ten years. What is very striking in this Table is that though the import of colonial butter has increased in that time by 17,400 tons and the foreign by 60,000 tons, the home production has stood still. If these ten years be divided into quinquennial periods the last five years show an average increase of 11,911 tons of colonial butter and of 28,466 tons of foreign over the previous five, while the home production has fallen off by 2,767 tons. The number of pounds of butter consumed per head of the population is regularly increasing, and was 13·83 lb. in 1897 against 10·24 lb. in 1888, or an increase of 3·59 in ten years.

Cheese.

Cheese from the Australasian Colonies arrives on the British markets about three months later than butter, but for the last two or three years the only one of these Colonies exporting cheese has been New Zealand, which during the year 1897 supplied the United Kingdom with 3,413 tons or 2·6 per cent. of the total import and 1·2 per cent. of the total consumption. Thus New Zealand cheese does not bulk very largely on our markets, nor has it any appreciable effect on prices, these being mostly governed by Canadian and

TABLE II.—*Estimated Home Production and Imports of Butter into the United Kingdom from* 1888 *to* 1897.

Year	Home	Colonial				Foreign									Grand total	Consumption per head of population			
	United Kingdom, *estimated*	Australia	Canada	New Zealand	Total	Denmark	France	Germany	Holland	Russia	Sweden	United States	Other countries	Total		Home	Colonial	Foreign	Total
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Lb.	Lb.	Lb.	Lb.
1888	85,411	352	465	790	1,607	30,221	22,003	8,090	7,751	315	10,291	1,181	2,110	81,965	169,016	5·18	·09	4·97	10·24
1889	81,351	99	1,136	713	1,948	33,870	28,326	5,553	7,553	420	10,608	5,515	2,599	94,414	180,743	5·08	·11	5·69	10·88
1890	85,572	786	758	1,216	2,760	41,237	26,255	5,223	7,903	418	11,212	4,228	2,250	98,626	186,958	5·11	·16	5·68	11·15
1891	86,472	1,274	2,313	1,432	5,019	43,811	26,760	5,776	7,327	482	11,749	3,185	2,672	101,761	193,252	5·12	·29	6·03	11·44
1892	81,684	2,663	2,979	1,713	7,355	43,177	27,134	6,212	7,092	1,852	11,444	2,312	2,522	101,804	190,534	4·80	·43	5·98	11·21
1893	76,709	6,290	2,158	2,092	10,540	46,740	23,416	8,250	7,141	2,694	13,370	1,147	3,076	105,831	193,083	4·47	·61	6·17	11·25
1894	87,628	11,324	1,044	3,281	15,649	55,125	21,232	6,888	8,258	3,060	13,315	1,500	2,815	113,093	216,370	5·06	·90	6·53	12·49
1895	79,652	13,007	1,947	2,663	17,617	58,139	22,712	5,617	9,561	6,128	15,540	3,317	2,293	123,667	220,936	4·55	1·00	7·07	12·62
1896	79,817	8,189	4,118	2,819	15,426	61,439	23,380	5,391	11,723	7,590	16,191	7,078	3,668	136,460	231,773	4·52	·67	7·73	13·12
1897	85,880	9,718	5,470	3,826	19,014	66,736	23,406	2,588	13,932	9,935	14,961	7,710	3,609	141,876	216,776	4·81	1·06	7·96	13·83
Mean 1888-92	84,705	1,035	1,530	1,173	3,738	38,463	26,093	6,170	7,505	697	11,061	3,290	2,430	95,720	184,160	5·06	·21	5·71	10·98
Mean 1893-97	81,938	9,705	3,007	2,936	15,649	57,636	22,635	5,747	10,123	6,121	14,675	4,156	3,092	124,186	221,787	4·68	·89	7·09	12·66
1893-97 Increase	—	8,670	1,477	1,763	11,911	19,173	—	—	2,618	5,424	3,614	866	662	28,466	37,627	—	·68	1·38	1·68
Decrease	2,767	—	—	—	—	—	3,458	423	—	—	—	—	—	—	—	·38	—	—	—

American. During 1897 the supplies from these two latter sources together amounted to 82·8 per cent. of the total import, and 38·8 per cent. of the total consumption. The imports of cheese from Canada alone were 76,351 tons, which largely exceeded those of all other countries and colonies combined.

During the present New Zealand cheese season prices have been very low, mainly due to the very large make in the United Kingdom last season, the great increase in the import of Canadian, and the injurious effect of the dispute in the engineering trades before mentioned. Owing to the short home make of cheese in 1896, caused by a dry season, prices then were very high, but the weather in 1897 being exceptionally favourable the make was everywhere abnormally large, and prices consequently declined to a very low level. During the recent season Canadian September cheese reached the lowest price on record. Table III. shows the values of Canadian cheese during the twelve months ended April 1898, compared with the previous year. The New Zealand season commences in January and finishes in June, and for the first four months of the present season prices have been disastrous to the shipper as they average 17*s.* 8*d.* per cwt. below the same period last year, while Canadian similarly shows a reduction of 15*s.* 3*d.* per cwt.

TABLE III.—*Average Top Prices per cwt. of Canadian Cheddar Cheese in London,* 1896–7 *and* 1897–8.

Season	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
1896–7 . .	48 2	17 0	45 0	43 6	44 6	51 0	53 6	52 9	55 2	60 9	59 2	58 3
1897–8 . .	57 5	48 6	43 5	41 0	47 9	47 7	46 6	45 3	44 2	43 0	42 3	42 9
Increase (+) or Decrease (−) in 1897–8	+9 3	+1 6	−1 7	+0 6	+3 3	−3 5	−7 0	−7 6	−11 0	−17 9	−16 11	−15 6

The total import of cheese into the United Kingdom for 1897 was 130,160 tons, and of this the Colonies supplied 79,782 tons, which is 61·3 per cent. of the total import, and must be considered very satisfactory, as ten years ago the colonial supply was only 34,767 tons. In 1897 the increase in the import of colonial cheese beats all previous records, reaching the extraordinary amount of 15,239 tons, while that from foreign countries increased only 2,695 tons, thus making the total increase on the previous year 17,934 tons. In cheese, as in butter, the home production has not increased during the past ten years, but unlike foreign butter the importation of foreign cheese has been a diminishing quantity, being last year 13,500 tons less than in 1890, while colonial has increased since then by more than 36,000 tons. The cheese colony *par excellence* is Canada, which in 1897 sent us 76,350 tons, or 34,000 more than in 1890. Last year, owing to a specially favourable season the make of cheese

TABLE IV.—*Estimated Home Production and Imports of Cheese into the United Kingdom from* 1888 *to* 1897.

Year	HOME	COLONIAL				FOREIGN						Grand total	Consumption per head of population			
	United Kingdom, *estimated*	Australia	Canada	New Zealand	Total	Belgium	France	Holland	United States	Other countries	Total		Home	Colonial	Foreign	Total
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Lb.	Lb.	Lb.	Lb
1888	146,856	—	33,417	1,350	34,767	1,928	1,415	16,454	40,617	699	61,113	242,736	8·91	2·11	3·71	14·73
1889	141,980	45	33,776	312	34,133	1,449	1,617	16,405	41,284	479	61,266	240,377	8·73	2·05	3·69	14·47
1890	147,078	25	41,894	1,425	43,344	990	2,018	14,611	45,920	270	63,809	254,231	8 78	2 59	3 81	15·06
1891	148,624	—	42,892	1,485	44,377	1,092	2,188	15,396	38,715	268	57,689	250,685	8·80	2·62	3·41	14·83
1892	140,391	—	51,930	1,279	53,209	1,302	2,280	13,691	40,922	237	58,432	252,035	8 25	3 12	3 43	14 80
1893	131,843	4	52,335	1,852	54,191	791	2,917	13,468	32,262	214	49,682	235,216	7 68	3·12	2 89	13 69
1894	150,611	419	57,105	2,270	59,824	1,797	2,648	14,935	33,617	486	53,483	263,918	8·69	3·45	3·08	15 22
1895	137,118	893	57,501	3,715	62,139	1,077	2,820	15,296	25,020	338	44,551	243,838	7·84	3·55	2 54	13 93
1896	130,000	3	61,785	2,755	61,543	1,564	2,281	14,649	29,059	127	47,683	242,226	7·36	3 65	2·70	13 71
1897	117,617	18	76,351	3,413	79,782	1,951	1,818	14,880	31,581	148	50,378	277,777	8·27	4·47	2·82	15 56
Mean 1888–92	145,586	14	40,782	1,170	41,996	1,352	1,909	15,310	41.498	390	60,461	248,013	8 69	2·50	3 61	14 80
Mean 1893–97	139,144	273	61,015	2,807	64,096	1,436	2,497	14,615	30,308	268	49,155	252,595	7·97	3 65	2·80	14·42
1893–97 Increase	—	259	20,233	1,637	22,100	84	588	—	—	—	—	4,582	—	1·15	—	—
Decrease	6,142	—	—	—	—	—	—	665	11,190	122	11,306	—	·72	—	·81	·38

in the United Kingdom is estimated, as in Table IV., at 17,600 tons in excess of 1896; thus the supply of cheese, home-made and imported combined, for 1897 was 35,500 tons in excess of the previous year, and largely explains the fall in prices referred to in a previous paragraph.

Home Production of Milk, Butter, and Cheese.

The production of milk, butter, and cheese in the United Kingdom in the year 1897 was considerably above the average of the past ten years, and only twice in that period has this production been exceeded—viz., in 1891, and again in that extraordinarily fertile year, 1894. The dairy industry of this country has suffered from a long series of bad seasons, four out of the last seven having been much below the average, while only two have exceeded it. The year 1897 was excellent for grass, hay and root crops, the three main sources of fodder for dairy purposes. The estimates of grass are never obtainable, while those for root crops are not yet published, but the Board of Agriculture, in its preliminary issue of agricultural statistics, estimates the total hay crop from permanent pasture for 1897 as 9,356,000 tons, against 7,965,000 tons in the previous year, thus showing an increase of 1,391,000 tons. The great increase in the grass, hay, and root crops naturally produced a relative augmentation in the quantity of milk, and in the amounts of butter and cheese made from it. From Table V. it will be seen that the increase in milk is estimated at 531,000 tons, of butter at 6,000 tons, and of cheese at 17,600 tons. All this must be gratifying to the British farmer and his friends; but unfortunately the prices, at least of butter and cheese, as already referred to, minimised to a great extent the advantages of the increased production. Though the home make of butter and cheese increased so largely last year it did not check the flowing tide of imported dairy produce, for 160,890 tons of butter and 130,160 tons of cheese were imported during the year, which was 9,000 tons more butter and 18,000 tons more cheese than in 1896. The markets of the United Kingdom were therefore supplied with 15,000 tons of butter, and 35,600 tons of cheese more than in the previous year.

Though an attempt is being made by the farmers in the United Kingdom to meet the competition of imported dairy produce, it cannot yet be said that it is meeting with success. Year by year the proportion of cows to the population is steadily decreasing, and it now stands at nearly ten cows per thousand of the people less than it did six years ago. In the high price paid for milk for household purposes in this country, compared with that in the Colonies and foreign countries, the British farmer has a great advantage over his competitors. He has not yet learnt, however, that it is not the individual colonial and foreign dairy farmer who is competing so severely with him, but the collective action of the farmers there, through the adoption of the co-operative principle

TABLE V.—*Estimated Production of Milk, Butter, and Cheese in the United Kingdom from* 1888 *to* 1897.

Year	Total number of cows and heifers in milk or in calf on June 4	Number of cows per 1,000 of population	Number of cows and heifers giving milk all the year round; say 75 per cent. of total	Influence of season. Percentage above or below the average of previous 10 years	Estimated total quantity of milk produced in the 52 weeks by 75 per cent. of the total herd, at 49 cwt. or 531 gallons per cow	Estimated total quantity of butter produced in the 52 weeks, taking 32 per cent. of the total milk to yield 80 lb. of butter per ton of milk	Estimated total quantity of cheese produced in the 52 weeks, taking 20 per cent. of the total milk to yield 220 lb. of cheese per ton of milk
					Tons	Tons	Tons
1888	3,853,002	104·4	2,889,752	+ 5·6	7,476,365	85,444	146,856
1889	3,814,593	102·6	2,860,945	+ 5·3	7,380,808	84,351	144,980
1890	3,956,220	105·5	2,967,165	+ 3·0	7,487,640	85,572	147,078
1891	4,117,707	108·9	3,088,281	Average	7,566,288	86,472	148,624
1892	4,120,451	108·1	3,090,339	– 5·6	7,147,337	81,684	140,394
1893	4,014,055	104·4	3,010,542	– 9·0	6,712,004	76,709	131,843
1894	3,925,486	101·2	2,944,115	+ 6·3	7,667,505	87,628	150,611
1895	3,937,590	100·5	2,953,193	– 3·5	6,982,087	79,652	137,148
1896	3,959,087	100·0	2,969,387	– 4·0	6,983,999	79,817	130,000
1897	3,966,855	99·3	2,975,111	+ 3·1	7,515,056	85,886	147,617
Mean 1888–92	3,972,394	105·9	2,979,296	+ 1·66	7,411,687	84,705	145,586
Mean 1893–97	3,960,614	101·0	2,970,461	– 1·42	7,172,130	81,938	139,444
Decrease in 1893–97	11,780	4·9	8,835	0·24	239,557	2,767	6,142

NOTE.—In estimating the quantity of milk, butter, and cheese produced within the United Kingdom for each of the last ten years, the "average milking life" of a cow is taken to be four years, from which it follows that on the average one-fourth of the total herd has to be renewed every year by heifers with their first calf. This leaves 75 per cent. of the total herd giving milk throughout the year. Each cow of this 75 per cent. is estimated as yielding 49 cwt. or 531 gallons of milk annually. It is assumed that 15 per cent. of the total milk yield is used for the calf, 32 per cent. is utilised for butter-making, 20 per cent. for cheese, and the remaining 33 per cent. consumed in the household as fresh milk. A ton of milk produces 80 lb. of butter or 220 lb. of cheese. A gallon of milk weighs 10·33 lb. (10⅓ lb.). The probable effects of each season upon the production have been fully considered in making these estimates.

in butter and cheese making. The individual dairy farmer in the colonies and foreign countries, finding that he could not ship his butter to this country with profit, has given up making butter and cheese, and devotes his energies entirely to the production of milk, leaving the manufacture of butter and cheese to the factory manager; and until the British farmer takes a leaf out of his competitors' book and adapts their methods of labour-saving to his surroundings he will never successfully compete with his opponents. Of the butter and cheese imported into the United Kingdom probably 95 per cent. comes through the working of the co-operative principle. The great advantage the foreigner has is cheap labour, but in the Colonies and in the United States labour is certainly not so cheap as at home. It is by effecting saving in labour that these countries are able to beat the British producer.

Prospects for Next Season.

Butter.—The Australian supply for next season ought to be larger than last, as the drought, which has so greatly restricted shipments for the past three seasons, is scarcely likely to continue for another year. Nevertheless the decrease in dairy cattle, caused either directly or indirectly by the drought, will prevent any very rapid increase in the amount of supplies from Australia. The import of butter from New Zealand will most probably continue to show that steady increase which has marked it during the last few years.

In the United States and Canada there is not expected to be such favourable weather for dairying as existed last year, but the low prices which were realised for cheese will be certain to cause a change in favour of butter-making in the coming summer, especially as it paid much better than cheese-making even in their own home markets during the last six months. The Spanish-American war will have little effect on the make or the export of United States dairy produce, as it will come in English vessels, direct from the United States ports or from Montreal.

In the United Kingdom and in Europe the past season has been phenomenal for large supplies, but as it is seldom that two such fertile periods come together, we may reasonably look for a smaller production and higher values; but as to the extent of this variation from last season it is impossible to predict with any degree of certainty.

The next Australasian butter season will not open until about October, and it is exceedingly difficult to forecast what supplies from all sources are likely to be then available, and how prices will probably rule. These depend greatly upon the weather in Europe, America, and Australia, but unless some unforeseen calamity occurs, such as a great war, or drought in some of the butter-producing countries, there is every prospect of large supplies, with prices, however, on the whole, better than last season.

Cheese.—This is not an increasing article of consumption even at

low prices, therefore it will be some time before the excessive supplies of last year are exhausted, and both makers and buyers, owing to the losses they sustained, will naturally be much more cautious in the amount of their output and in their purchases. This will restrict the make, whether the season be fertile or otherwise, and thus there is a great probability of higher values being obtained in 1898 than in 1897.

THE HISTORY OF PLEURO-PNEUMONIA.[1]

It is quite conceivable that to some of the stockowners of the present day who have benefited by the legislation which has practically stamped out pleuro-pneumonia in this country, a report on the subject of an almost extinct disease may be of very little or no interest. But the agriculturist who lived prior to the early sixties, at which date there was no legislation in this country for the suppression of contagious diseases of cattle, appreciating the vastly improved conditions under which he now carries on his business compared with thirty years ago, will, it is presumed, be interested to know something of the nature and history of a disease which at one time caused him such heavy losses, as well as the means by which that disease has been so successfully combated in this country.

At the period referred to (1860–1865) pleuro-pneumonia was so widely spread that every farmer and cowkeeper had begun to regard it as an inevitable evil in connection with his business, and one from which he saw no means of escape. Some of them had a faint notion that the disease was originally of foreign origin, but had at that time become so general that it would never again be exterminated.

The persons who sustained the greatest losses were the farmers in the dairying districts and the cowkeepers in the large cities, more especially London, and it is a matter of surprise how they then derived sufficient profits from their business to enable them to support their heavy losses.

Some idea may be gathered of what the losses must have been by giving a brief description of the ravages of the disease in the Metropolitan cowsheds some 30 or 40 years ago.

It should be explained that prior to the introduction of the cattle plague in 1865, London depended largely for its supply of milk upon the cows kept in the Metropolis and the counties immediately surrounding, the trade in railway-borne milk being then in its infancy. The stock of cows in London at the present time is estimated at about four thousand, but it is believed that in 1865 there were probably ten times that number. Many of the cow-

[1] From the Report of the Chief Veterinary Officer (Mr. A. C. Cope), Board of Agriculture, in *Annual Reports of Proceedings under the Diseases of Animals Acts, &c., for the year* 1897.

keepers must then have been very wealthy persons, as some of them possessed hundreds of milch cows—indeed, it has been stated that the stock of one proprietor in the North of London amounted to nearly a thousand animals, which were distributed as a matter of course in numerous sheds. When one considers that the cows were kept under conditions very favourable to the extension of a disease which is spread by cohabitation, it becomes easy to realise the losses which attended the conduct of such a business on so large a scale. In fact, it may be taken for granted that the sheds containing these cattle could hardly ever have been free from the disease.

The entire absence of laws restricting the movement of diseased or infected stock, or their sale in public markets, naturally led to the distribution of the disease. The common practice with the ordinary cowkeeper when an outbreak occurred on his premises was to slaughter all the cows obviously affected, sell those cattle in contact with them, and buy a new lot. Thus each man in his turn became the means of constantly multiplying the number of infected centres.

The losses among the smaller cowkeepers were equally serious, and it was a matter of daily occurrence to see cows in the last stages of the disease driven or conveyed in carts from the sheds to the slaughter-houses in the East-end of London. A similar state of things existed in Edinburgh, Glasgow, Dublin, and other large towns throughout the United Kingdom.

Quite recently I was informed by one of the largest cowkeepers now in London that years ago he hardly knew what it was to go many weeks without a case occurring in his sheds, and his regular practice when he wanted to replenish his stock with twelve fresh cows was to purchase twenty, feeling that by the time twelve of them had arrived at a condition fit for the butcher, probably eight would be attacked and have to be slaughtered.

In some of the rural districts similar losses were incurred, and it is within my recollection that pleuro-pneumonia was constantly brought into the cowsheds on the large dairy farms in Somerset in the years 1862–3 by infected Irish stock purchased in Bristol market. In the months of April and May it was customary for the farmers in that part of the country to purchase twenty to forty young milch cows to replenish their stock which from various causes had gradually been reduced during the winter. If, unfortunately, an infected lot had been purchased, some of them would fall out of the drove while being driven from Bristol to the farms, and of the remainder a proportion would develop the disease shortly after their arrival and die or be slaughtered; and if the disease extended to the stock already on the premises the owner would probably dispose of the whole of his herd in the local markets.

The common practice all over the country in those days was to call in veterinary aid and treat the disease as an ordinary complaint. With our present knowledge of the pathology of pleuro-

pneumonia—that partial recovery by a natural process is by no means uncommon—it is certain that these animals often became the origin of new outbreaks of the disease after their removal.

This condition of things continued throughout Great Britain until the much more fatal and infectious cattle plague was introduced in 1865. It was then for the first time that a check was given to the spreading of pleuro-pneumonia as a result of the restrictions placed upon the movement of cattle throughout Great Britain for the purpose of arresting the former disease, and there is no doubt that at the close of 1866, when the cattle plague was stamped out, an impression had already been made upon the prevalence of pleuro-pneumonia, at least in Great Britain. The disease, however, continued to spread in Ireland during all that time, because the cattle plague restrictions were not applied generally in that country.

It was not until the year 1869 that any legislative measures specially directed to prevent the spreading of pleuro-pneumonia were adopted.

The Contagious Diseases (Animals) Act, 1869, which repealed all former Acts, provided for the compulsory slaughter by local authorities of all animals affected with cattle plague, and the payment of one half the value (not exceeding 20*l.*) by way of compensation, and also gave discretionary power to local authorities to slaughter contact animals, paying as compensation for such animals three-fourths value (not exceeding 30*l.*); but neither slaughter nor compensation was required under that Act in the case of pleuro-pneumonia.

Provision was, however, made in that Act for serving a declaration on the occupier of any premises, lands, &c., where pleuro-pneumonia was found to exist, and thereupon certain rules contained in the 7th Schedule to that Act came into force, which had for their object the prohibition of the movement of diseased cattle from those premises, &c., except for immediate slaughter, and also of any other cattle found on those premises, but slaughter was not compulsory, and if no fresh cases occurred within thirty days the local authority were bound to so determine, and the rules thereupon ceased to operate in relation to those premises.

This unsatisfactory state of the law continued until 1875, when, by an Order of the Privy Council, made under the powers of the Act of 1869, local authorities were required to slaughter all cattle affected with pleuro-pneumonia and pay compensation at the rate of three-fourths of their value (not exceeding 30*l.*). From 1875 to 1878 the law remained unaltered, and the disease continued with more or less prevalence throughout the country, but beyond the fact that the owners of diseased cattle obtained compensation in cases where they gave notice of the disease existing on their premises, no benefits followed upon the passing of the Order, at least so far as the reduction of the disease was concerned.

The Act of 1878 was a very great improvement upon all former legislation of the kind. It made compulsory the slaughter of all cattle affected with pleuro-pneumonia with payment of three-fourths value (not exceeding 30*l.*) as compensation, and it gave local authorities power to slaughter any cattle in contact, paying full value for the same (not exceeding 40*l.*), and, what was still more important, it extended the period of detention of contact cattle from thirty to fifty-six days, the local authorities having power to extend that period if they thought fit.

One great blot upon the legislation, however, still remained—namely, the power which local authorities possessed, and often exercised, to declare premises free at the expiration of fifty-six days after the last known case, the result being that cattle capable of infecting others could be moved out of sheds when declared free, and healthy animals admitted to the premises where they might contract disease by cohabiting with those left, which, although apparently healthy, were capable of transmitting the disease to the fresh arrivals. To meet this the Privy Council, in the Animals Order of 1884, prohibited the movement of cattle "into" a place infected with pleuro-pneumonia until all the cattle therein had died or been slaughtered, or had been moved thereout.

Finding that the disease still had a tendency to increase, and that the local authorities generally failed to exercise the full powers given them under the Act of 1878, which authorised them to slaughter not only diseased cattle but also those in contact, the Privy Council in 1886 applied to Parliament and obtained power to require local authorities in Great Britain to slaughter all cattle actually affected, and all cattle suspected, or being in the same field, shed, or other place, or in the same herd, or otherwise in contact with affected animals, or of having been otherwise exposed to infection.

In pursuance of the Act of 1886, a general Order was issued in March, 1888, requiring local authorities to slaughter within ten days all cattle being or having been in the same field, shed, or other place, or in the same herd, or otherwise in contact with affected cattle.

This Order was not attended with such good results as were anticipated, partly on account of the narrow views taken by some local authorities as to what constituted contact, and partly by reason of the fact that the local authorities in whose districts the disease had appeared had no power to trace infected or diseased cattle which had come from districts beyond the limits of their administrative areas.

For these and other reasons it became obvious that if the disease were to be stamped out it was absolutely necessary that it should be dealt with by the Central Authority, and it was on these grounds that the Contagious Diseases (Animals) (Pleuro-Pneumonia) Act, 1890, was introduced by Mr. Chaplin, the first President of the Board of Agriculture. This Act transferred to the Board all the

duties previously vested in the local authorities, with power to slaughter and pay compensation out of the Imperial funds for all cattle affected, or which had in the opinion of the Board been exposed to infection, quite irrespective of the locality of the county or district in which the cattle might be found.

General Distribution of Pleuro-pneumonia.

Of all the diseases of a fatal character affecting animals of the bovine race pleuro-pneumonia is the most widely distributed. Until quite recently it existed in every country in Europe, except Scandinavia, Holland, Spain, and Portugal. It prevails in various parts of China, India, Africa, and Australia.

In Europe it was first discovered in Hesse in 1693, and it has existed as an epizootic in Central Europe since the middle of the eighteenth century. At the end of the eighteenth century it appears to have existed throughout Germany, France, and Italy, and there is no doubt that this distribution of the disease was greatly due to the wars which were carried on at the close of the century, each Continental army bringing the infection in its wake. Sweden became infected, in 1847, by cattle sent from this country; and Norway, in 1869, by stock taken from Scotland. The disease was conveyed to South Africa as far back as 1854 by cattle imported from Holland, and has never been eradicated from that country.

In 1858 it was carried to Australia by means of a cow landed at Melbourne along with four others in the month of October of that year. The affected cow was to all appearances healthy at the time of her arrival, was in good condition and giving milk, but developed the disease and died in November, six weeks after her arrival. Two more of the same consignment died in the following months of December, 1858, and January, 1859, a third and fourth appear to have been attacked with the disease, but recovered, whilst the fifth remained apparently healthy. The apparently recovered cattle became the means of infecting the rest of the herd with which they were placed on their arrival, and it was not until September, 1859, almost a year after the landing of the diseased animals, that the colonists became aware of the existence of the malady on the estate, when it was discovered that twenty-three had died, five had recovered, and ten were still ill. The whole herd, consisting of fifty-one head, were then slaughtered, and the owner compensated. No further interest, however, seems to have been taken in the matter at the time, nor were legislative measures adopted, the result being that the disease extended unrecognised into the interior, and has never been eradicated from Australia; in fact, two cargoes of cattle in which eighteen were found to be affected with pleuro-pneumonia were sent to this country in 1895 from New South Wales.

From Australia pleuro-pneumonia was introduced into Tasmania and New Zealand in 1864, but was eradicated in both countries by the sanitary measures adopted.

In 1859 it was conveyed to the United States of America by some cattle imported from Holland, where the disease was then rife. The animals were taken to Massachusetts, whence the disease spread to many of the Eastern States.

From the above description of the mode by which the infection of pleuro-pneumonia has from time to time been conveyed to the various countries of the world, it will be seen that the living diseased animal has always been the medium of its distribution, and that in those countries where it has obtained a foothold the prevalence of the disease has been in a corresponding ratio to the facilities afforded for the movement of affected stock. In fact, it may be confidently asserted that there is absolutely no record of a country, previously free from pleuro-pneumonia, that has been infected by any means short of the importation of a living diseased animal.

History of the Disease in Great Britain.

There is a tradition, but I am unable to find its origin, that pleuro-pneumonia was introduced into the United Kingdom by some calves which were imported into Cork from the Netherlands about the year 1840, and that in the ordinary course of the cattle traffic it was conveyed to England and found its way into the London cowsheds, where it is known to have been rife in the year 1842. This may or may not have been the origin of the disease in Great Britain, but when we take into consideration the fact that fifty years ago the veterinary profession as a whole were unacquainted with the diseases of animals other than the horse, it may not be regarded as ungenerous or unfair to state that it is probable that the disease had existed here for some years prior to 1842.

Unfortunately, for many years after the disease had become prevalent, there were many in the veterinary profession in this country, including some of its leading men, who regarded pleuro-pneumonia as being due to climatic influences.

The fact, however, that of late years the disease has been nearly, if not quite, eradicated under the stamping-out system, not only here but in other countries, conclusively demonstrates the error of the views then entertained. It may be accepted that after its first introduction it was frequently imported by foreign cattle at the time when they were permitted to be moved into the interior of the country after an inspection and detention of only twelve hours at the port of landing. In connection with this I find in one of the veterinary journals for the year 1848 a letter from a veterinary surgeon who appears to have recognised the disease in 1837 among some cattle at Putney belonging to Lord de Grey. He refers to the disease as being identical with the *lungenseucht*, which he had seen amongst the cattle in India and in Germany, in which latter country he stated they then slaughtered and paid compensation for the diseased animal, and in his letter he animadverts upon the defective system of examination at the ports where foreign cattle were landed in this country. He gives no description of the

clinical symptoms or the *post-mortem* appearances of the cases which he saw, but from the fact that he regarded the disease as identical with that for which the Germans legislated and paid compensation, it may reasonably be assumed that he believed the disease to be contagious pleuro-pneumonia. Assuming that he was correct in his view as to the nature of the disease, it would appear that it existed in this country prior to 1840.

The following Table gives statistics of pleuro-pneumonia in Great Britain since 1870, at which date returns were first collected by this Department, and shows how rapidly the disease declined after the application of the stamping-out system in September, 1890 :—

Year	Number of infected counties	Number of fresh outbreaks	Number of cattle attacked	Diseased cattle		Healthy cattle in contact slaughtered
				Killed	Died	
1870	68	1,508	4,602	1,755	1,276	2,035
1871	68	1,669	5,869	2,207	1,339	1,836
1872	71	2,474	7,983	3,871	1,979	3,245
1873	72	2,711	6,787	5,061	1,028	2,030
1874	71	3,262	7,740	7,434	289	1,485
1875	71	2,492	5,806	5,584	190	1,417
1876	66	2,178	5,253	5,131	114	1,288
1877	70	2,007	5,330	5,223	107	1,353
1878	67	1,721	4,593	4,488	114	1,357
1879	63	1,549	4,414	4,296	119	2,042
1880	51	1,052	2,765	2,681	88	1,389
1881	45	729	1,875	1,797	78	914
1882	46	494	1,200	1,161	39	962
1883	40	349	931	897	35	981
1884	33	312	1,096	1,074	20	751
1885	41	404	1,511	1,469	42	1,167
1886	48	553	2,471	2,409	63	2,446
1887	47	618	2,437	2,384	52	3,817
1888	39	513	1,843	1,786	59	8,722
1889	41	474	1,646	1,603	42	7,297
The Contagious Diseases (Animals) (Pleuro-Pneumonia) Act, 1890, came into force on September 1, 1890.						
1890	36	465	2,057	2,004	55	11,301
1891	27	192	778	778	—	9,491
1892	10	35	134	134	—	3,477
1893	4	9	30	30	—	1,157
1894	2	2	15	15	—	391
1895	1	1	1	1	—	43
1896	1	2	9	7	2	183
1897	3	7	46	46	—	741

During the last two years pleuro-pneumonia has been confined to a comparatively small district in and around the East-end of London. In 1896 only two outbreaks were discovered, one in the County of Essex and the other on the premises of a butcher in the East-end of London. In 1897 seven outbreaks were confirmed. Of these five were in the London cowsheds, one in the County of Essex,

and the other in that part of the County of Middlesex which borders on the northern boundary of the County of London.

In consequence of the persistence of the disease in the cowsheds of London, and it being impossible to trace the origin of the diseased animals, the Board, in order to prevent the movement of infected or diseased cattle into the interior of the country, issued an Order which came into force on August 23, 1897, prohibiting the movement of cows out of any licensed cowsheds in an extensive district in the East-end of London, except for slaughter with a licence to a registered slaughter-house within that district.

At the time when the Order was issued a general impression existed that there still remained in these sheds some cows in which the disease existed in a form unrecognisable during life, and the Board therefore appointed three veterinary surgeons to grant these licences and to attend the autopsy of each cow slaughtered under the provisions of this special Order. The Order had only been in force a few weeks when one of these veterinary surgeons discovered in the lungs of a cow, which during life appeared to be perfectly healthy and was fat and in very good condition, extensive lesions of pleuro-pneumonia of long standing. Sixteen other cows in the same shed were slaughtered and two more cases were detected. In one the greater part of one large lobe was affected, and portions of the lung structure had become necrosed and were in a friable condition. In the other a small portion of encapsuled necrosed lung was found, and from the thickness and density of the enveloping tissue there is no doubt that the animal had been infected months prior to its slaughter.

This centre of disease would probably never have been detected but for the steps adopted by the Board in requiring a *post-mortem* examination at the time of the slaughter of these shed cows. The action taken has proved conclusively that the views of the Department as to the existence of unrecognisable cases in the living animal among the cattle in the London sheds were correct.

In this connection it may be of interest to quote from a report made in 1878 for the Royal Agricultural Society by Professor Gerald F. Yeo, Journal of the R.A.S.E., Second Series, vol. xiv., Part I., p. 196 : "From comparing the lung lesions with the clinical history, I have often been forced to believe that the disease had existed for a very much longer time than was believed during the life of the animal. In one case, where the cow was described as having been in perfect health three days before I saw the lungs, and was said to have given nine quarts of good milk the day before, I found lesions in the lung which, I think, must have taken at least six weeks for their production, associated with the first stage of intense pleuritis. Another cow, which was said to have been well, and milking five days before death, had a condition of lung which I cannot imagine could be developed under four or five months. . . . I am convinced that the lung disease usually exists for months without being suspected, and invariably the beast is first thought to be sick only when the affection has spread to the

pleura, and caused intense inflammation of that membrane with its accompanying well-marked symptoms."

Etiology.

The etiology or cause of pleuro pneumonia has, ever since its infectious nature was accepted, been a subject of inquiry by many of the leading scientists, including bacteriologists, more particularly abroad. Friedlander, in his work on Infective Diseases of Animals, states that after Dr. Williams, Zuon, Hallier, Weiss, Putz, Sussdorf, Brozzala, Bruglants, Verriest, and Luistig had been engaged in the task of investigation of the contagion, Pols and Nolen, of Amsterdam, in 1886, discovered a round micrococcus, which they believed to be the cause of the disease. Inoculation experiments were conducted by them upon upwards of a hundred cattle with pure cultivation of this organism, but none of the animals became infected with typical pleuro-pneumonia. M. Pasteur carried out investigations with the same object, but he abandoned the inquiry because he was unable to discover any medium in which the specific organism could be cultivated. More recently Professor Arloing, of the Lyons Veterinary School, made the announcement that he had discovered an organism which he called the *bacillus pneumoliquefaciens bovis*, and which he believed to be the cause of pleuro-pneumonia, but up to the present time no pathogenic organism has yet been discovered which is capable of producing in the lung of a healthy animal the lesions which are peculiar to, and always present in, contagious pleuro-pneumonia.

That the disease is specific in its nature no one would now express a doubt, and further inquiries into its etiology may even yet lead to the discovery of a special pathogenic organism.[1] There are, however, certain features in connection with this disease which render it dissimilar to the other contagious diseases of animals, and militate against successful experimental inquiries.

1st. Pleuro-pneumonia is a disease which cannot be communicated to animals other than those of the bovine race.

2nd. It has never been produced in an animal, even of the same class, by what is termed mediate contagion.

3rd. The infective germs appear to be transmitted only by the breath of the living diseased beast, and their power to infect ceases with the death of the diseased animal.

In this country attempts have been made over and over again to infect healthy cattle through the medium of the offal, manure and lungs of diseased cattle. The diseased lungs have been removed from the animals immediately after slaughter and placed in the mangers of the healthy cattle without communicating the disease. Inoculations with the fluid exudation taken from the lungs of advanced cases, in which material there is a reasonable presumption that the infecting organism exists, have also been made. This

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[1] Since this was written the discovery of the bacillus of pleuro-pneumonia has been announced, see p. 385.—ED.

system of inoculation was for many years carried out in the cowsheds of London and Edinburgh as a preventive, and although thousands of cattle have been thus treated, there is no instance on record of any animal having contracted contagious pleuro-pneumonia by either of the above methods. In this respect pleuro-pneumonia holds a unique position among the infectious diseases of animals. Whereas cattle plague, foot-and-mouth disease, glanders, and, indeed, all the other diseases which have been legislated for in this country, can be communicated by mediate contagion or cohabitation, it appears to be very probable that the only means by which pleuro-pneumonia is transmitted is the inhalation by the healthy of the breath of a living diseased animal.

Symptoms.

Diseases affecting the internal organs of cattle, especially those of the respiratory system, are extremely difficult to differentiate in the living animal.

Advanced cases of tuberculosis, in which pleurisy is present, are frequently mistaken for pleuro-pneumonia, the clinical evidence being often identical. Sporadic pleuro-pneumonia, produced by exposure to cold or wet, presents symptoms analogous to those of the contagious form. Traumatic carditis, and even cattle plague, when it assumes the pneumonic form, have often been mistaken for pleuro-pneumonia. This difficulty of diagnosis in the living animals being recognised by all experienced persons, experts of the present day as a rule decline to give any decided opinion as to the nature of any disease affecting the lungs of cattle until they have had an opportunity of making a *post-mortem* examination.

Where contagious pleuro pneumonia attacks an animal in the acute form, all the symptoms commonly attending upon lung affections become manifest, but if the disease assumes the mild or chronic form, in which only a small portion of lung is involved, it is by no means uncommon for the animal to pass through the disease without exhibiting any marked evidence of lung mischief.

Ordinarily when an outbreak occurs among a herd of shed-cows the first indications of its presence which appeal to the mind of the attendant is the diminution or perhaps sudden cessation of the secretion of milk. At this stage it is usual to find that the appetite has fallen off, the animal coughs more frequently than usual, the bowels are constipated, and rumination has been suspended.

If an animal be carefully examined when these definite symptoms are discovered it will be found that fever has already developed, and the temperature, which in the healthy animal ranges from 101° or 102° F., according to the conditions in which it is kept, will have risen to 104° F., or perhaps as high as 106° F. The presence of fever may be regarded as evidence that exudation and consolidation have already taken place in the structure of the lungs, or that the

pleural covering has become affected. In acute cases the evidence of lung mischief quickly increases, the breathing becomes more frequent, the pulse more rapid, and if the animal is driven or excited violent coughing is produced. There is a great disinclination on the part of the animal to turn round in its stall, an act which generally brings forth a grunting sound from the chest Auscultation cannot often be relied upon, partly on account of the thickness of the walls of the chest and also because the portion of the lungs involved may be situate in the anterior portion of the chest above the sternum or breastbone or beneath the large bones and muscles of the shoulder, through which the normal respiratory murmur cannot be heard. Pressure along the sides of the vertebræ immediately behind the withers, and in the spaces between the ribs, will cause the animal to crouch or flinch. As the disease progresses the cough becomes constant and very painful; this is indicated by a moaning or grunting sound which follows each inspiration.

If the consolidation extends to or is present in the large or posterior lobes of the lung which are placed within the ribs immediately behind the shoulder, percussion of the side over the affected part produces a dull sound, while absence of respiratory murmur may be found on auscultation. As the fever increases the muzzle becomes hot and dry, the ears droop, and the temperature may rise to 107° F.; in the last stages the appetite ceases, and gradually becoming weaker the animal falls down and lies in a recumbent position, roaning and constantly coughing, and, with the head stretched out, the tongue protruding from the mouth, and a painfully anxious look, it finally dies from suffocation.

HAY HARVEST FORECASTS, 1897.

The results of the checking of the Hay Harvest Forecasts issued in 1897 by the Meteorological Office show that the general percentage of success for the entire country was 90, or 2 per cent. higher than in 1896. The largest percentage of success last year in any district was 98 in England, S, but 90 per cent. and upwards was attained in several other English districts, as well as in Ireland, S. At some individual stations the percentage was still higher—*e.g.*, 100 at Norwich, Maidstone, and Caversham (Oxon). The smallest percentage of success was 83 in Ireland, N. In Ireland the percentage could scarcely be expected to be so high, but 90 per cent. was nevertheless recorded at Lavistown, Kilkenny.

The telegrams were sent daily between 3.30 p.m. and 4 p.m. on each week day for a period of about five weeks, the issue commencing in some of the southern districts on June 7, and extending to other parts of the kingdom in the course of the ensuing five weeks.

In addition to the recipients named in the list the forecasts were sent by wire daily to seven other gentlemen at their own cost,

SUMMARY OF RESULTS.

Districts	Names of Stations	Percentages				Sum of all successes, complete and partial
		Complete success	Partial success	Partial failure	Complete failure	
Scotland, N.	Golspie and Munlochy	80	12	8	—	92
Scotland, E.	Rothiemay, Glamis, and Aberfeldy	68	25	7	—	93
England, N.E.	Belford and Ulceby	67	26	7	—	93
England, E.	Thorpe and Rothamsted	78	15	5	2	93
Midland Counties	Warwick, Cirencester, Much Wenlock, and Retford	69	20	9	2	89
England, S.	Maidstone, Downton, Caversham, and Wye	78	20	2	—	98
Scotland, W.	Dumbarton, Ardwell, and Islay	68	22	7	5	90
England, N.W.	Knutsford and Leyburn	63	22	13	1	85
England, S.W.	Glastonbury, Clifton, and Tortworth	62	24	11	2	86
Ireland, N.	Edgeworthstown and Moynalty	59	24	11	6	83
Ireland, S.	Tralee and Kilkenny	62	28	8	2	90
	Mean for all districts in 1897	68	22	8	2	90
	„ „ „ in 1896	59	29	10	2	88
	„ „ „ in 1895	60	29	9	2	89
	„ „ „ in 1894	61	28	10	1	89
	„ „ „ in 1893	64	27	8	1	91
	„ „ „ in 1892	56	32	10	2	88
	„ „ „ in 1891	58	31	10	1	89

THE SPRING OF 1898.

IN a fickle climate like our own the seasons not infrequently bid a mocking defiance to the rigid bonds inscribed in the calendar. A notable instance of this occurred during the present year. The winter was, as is well remembered, unusually mild, but about the middle of February, when the season should have been drawing to a close, the weather became very much colder, the altered conditions lasting throughout nearly the whole of March. So marked was the change that in London and many other parts of the country the latter month was not only relatively, but actually, colder than February, and much colder than January, the ordinary annual rise of temperature being in fact completely reversed. Another evidence of the lagging of winter was shown by the prevalence of cold winds from the northward or north-eastward, and frequent snow showers, the number of the latter being far greater in March than during the whole of the three preceding months. The inclement

weather seems to have reached its culminating point between March 24 and 27, when a strong gale from the north-eastward swept over nearly the whole of the United Kingdom. In the East and South-East of England the storm was especially severe, and was accompanied in many places by snow of considerable depth, evidences of the latter being visible in sheltered spots until well on in April.

Soon after the commencement of April the weather became much milder, but at the same time remained very changeable, with heavy rain in the second week. Towards the middle of the month a colder and drier spell set in and lasted for some ten or twelve days, the wind over the southern parts of the country being mainly from the eastward or north-eastward. With the close of April, however, the period of dry weather which had prevailed for so many months came to a decided end. The partial drought may be said to have commenced about the close of September last. Taking the entire period of seven months, ranging from October, 1897, to April, 1898, it is found that in the eastern, the south midland, and the southern counties of England, east of Somerset and Devonshire, the rainfall amounted as a rule to less than two-thirds of the normal. In some localities the proportion was very much smaller than this. At Cambridge, for example, there was only 53 per cent. of the average, in London 57 per cent., at Rothamsted and Hastings 55 per cent., and at Yarmouth 51 per cent., while at Dungeness, where the rainfall is usually small, the actual amount recorded in the seven months was no more than 39 per cent. of the average.

One extreme soon gave place, however, to another, and in May the rains were so abundant that at the end of the month farmers were beginning to long for a return of dry weather. The pastures were, it is true, benefited to an incalculable extent, but the excessive moisture was accompanied as a rule by so low a temperature that the growth of cereals was unhealthily slow. At the commencement of June matters were even worse, a cold northerly wind on the first of the month being accompanied by snow and sleet showers which found their way as far south even as some portions of Oxford and Bedfordshire. To the agriculturist the spring of 1898 was, in fact, a time of varying anxiety, the fears engendered early in the season by the prolonged drought giving place later to an even more serious apprehension with regard to the constant rains and the marked absence of warm sunshine. In the present state of meteorological science nothing can, unfortunately, be done in the way of forecasting an approaching season, and in the meantime one can only caution the farmer against placing any reliance upon those who profess to tell what the weather is likely to be weeks or even months ahead. An occasional and chance success in this direction may establish a passing reputation, but it seems hardly likely that a problem which at present baffles the scientific skill of the meteorologists, not only of this but of all other civilised countries, is likely to be revealed suddenly to those who have devoted to the question an infinitesimal amount of time and study.

The leading features in the weather of last spring are shown in

a statistical form on p. 420, the following remarks giving further details of interest in the history of each particular element.

Temperature.—The mean temperature over England varied greatly from time to time. In March it was, as has already been stated, mostly below the average, an excess being, however, shown about the third week. The earlier half of April was fairly mild, but in the latter half there were great fluctuations, the mean values over the country generally showing no very wide departure from the normal. In May the first and last weeks were fairly warm, but the middle part of the month was decidedly cold, the deficiency of heat being greatest in the third week. Taking the season as a whole the mean temperature was below the average, the deficit being, however, very slight in the north-eastern counties, and also in the Channel Islands. In the former of these districts the nights were relatively colder than the days, but in the south-western counties and the Channel Islands the deficiency of warmth appears to have been distributed almost equally through the twenty-four hours, while in all other districts it was far more noticeable by day than by night. A comparison with the records of previous years shows that over England generally the past spring was the coldest experienced since 1892. In that year the temperature was lower than in this, and in 1891 much lower. The coldest spring of the past twenty-five years was in 1887, although that of the terribly inclement year 1879 was very little better. The warmest was that of 1893, a season which will further be remembered as by far the driest of recent years. The highest temperatures in the spring of this year occurred as a rule on May 23, when the thermometer rose above 70° in all but the northern parts of the country, and slightly above 75° in some parts of our eastern and midland counties. Prior to this date, or in some cases to the 22nd, the thermometer never touched 70°, the absence of high temperatures earlier in the season being very unusual. In the eastern parts of England the highest readings were slightly in excess of those recorded in the spring of 1897, but in other districts they compared unfavourably with those in most recent years. The lowest temperatures of the season were registered early in March—mostly at some time during the second week—when the sheltered thermometer in the more northern and central districts registered ten or eleven degrees of frost. In the southern counties, however, there were not more than six degrees of frost, while in the Channel Islands the thermometer only just touched the freezing point. The spring frosts were sharper than in most recent years, but less so than in 1895, when the thermometer in some parts of the midland and south-western counties fell early in March a little below 20°.

Rainfall.—Until about the middle of April there was an almost constant deficiency of rain, the only exception being at the close of March, when, owing largely to the snow-storms of the 24th to 27th, an excess was reported in the eastern and southern counties. During the latter half of the season, however, there were only two dry weeks—viz., at the close of April and the close of May, the first

Temperature, Rainfall, *and* **Bright Sunshine** *experienced over* **England** *and* **Wales** *during the Thirteen Weeks ended May* 28, 1898.

(*The Spring Season.*)

Districts	Temperature							
	Highest observed	Lowest observed	Day temperatures		Night temperatures		Day and night temperatures combined	
			Mean	Difference from average	Mean	Difference from average	Mean	Difference from average
	°	°	°	°	°	°	°	°
North-eastern counties . .	67	22	50·6	−0·2	37·8	−0·8	44·2	−0·5
Eastern counties . . .	77	22	52 7	−1·2	37·2	−0·9	45·0	−1 0
Midland " . . .	72	21	53·1	−1·5	37·0	−0·7	45·1	−1·1
Southern " . . .	76	26	52·7	−1·8	39·9	−0·2	46·3	−1 0
North-western counties, including North Wales .	68	24	51·5	−1 3	39·5	−0·4	45 5	−0 9
South-western counties, including South Wales .	74	21	52·6	−0 9	40·1	−0 9	46·4	−0 9
Channel Islands . . .	71	32	53·4	−0·3	44·2	−0 2	48·8	−0·3

Districts	Rainfall				Bright Sunshine			
	Days with rain		Total fall		Duration		Percentage of possible amount	
	Number	Difference from average	Amount	Proportion of average amount	Hours recorded	Difference from average	Percentage	Difference from average percentage
			ins.	per cent.				
North-eastern counties .	50	+5	6·0	112	364	−20	29	−2
Eastern counties . .	45	+3	5·0	98	431	−28	35	−2
Midland "	45	+5	5·7	103	388	−14	32	−1
Southern "	44	+5	5·9	106	416	−38	34	−3
North-western counties, including North Wales	45	+2	7·4	121	469	+74	38	+6
South-western counties, including South Wales	47	+5	8·2	116	508	+ 9	42	+1
Channel Islands . . .	54	+8	7·1	116	524	−54	43	−5

NOTE.—The above Table is compiled from information given in the Weekly Weather Report of the Meteorological Office. The averages employed are: For Temperature, the records made during the twenty-five years, 1871–95; for Rainy Days, the values for the fifteen years, 1881–95; for Total Rainfall, those for the thirty years, 1866–95; and for Bright Sunshine, those for the fifteen years, 1881–95.

three weeks of the latter month being marked by very heavy rains, especially in the South. A glance at the table shows that the wet weather of May was sufficient to counterbalance the drought experienced earlier in the season, the total rainfall for the entire spring being in excess of the average in all but the eastern counties. In the midland and southern districts the excess was certainly very slight; but in the North-East it amounted to 12 per cent., in the South-West and the Channel Islands to 16 per cent., and in the North-West to as much as 21 per cent. A comparison with previous years shows that over England generally the spring was wetter than in most recent years, but drier than in 1897, and much drier than in 1889. The driest spring of the past twenty-five years was undoubtedly that of 1893, the wettest being in some places 1889, in others 1886, and in others 1877 or 1878. During the past season individual heavy falls of rain were somewhat rare, for even in May the precipitation was noticeable more for frequency than for any great weight. The principal cases appear to have occurred in the North of England on April 11, and again on April 28; in the North and East on May 20, and in the South and South-West of England on May 24. On May 2, the neighbourhood of Plymouth was visited by an extremely heavy hail-storm which occasioned a large amount of damage to the fruit blossoms. In the town itself 1·1 inch of rain and melted hail fell in the space of three-quarters of an hour, 0·9 inch being registered in the short space of twenty-five minutes. Thunderstorms were experienced in many places at the close of April and the beginning of May, and again during the last ten days of the latter month.

Bright Sunshine.—During the earlier part of the season great variations were observed in the prevalence of bright sunshine, the general tendency being, however, for a deficiency. After the beginning of April an improvement took place, and for about three weeks the weather was fairly sunny. In May, however, there was a general falling off, the month being in some places the dullest experienced for many years past. Taking the season as a whole, the amount of bright sunshine was less than the average in all but the western districts, the deficiency being mostly slight, but greatest in the South. In the South-West there was a trifling, and in the North-West a large, excess. Over the country generally the season was far more cloudy than in most recent years, and especially dull in comparison with the brilliant spring of 1893.

Average Prices of English Wheat *per Imperial Quarter of* 480 *lb., as based on the Returns from the Scheduled Corn Markets of England and Wales, from* 1842 *to the present time.*

Year	Annual average		Extreme weekly averages: Highest		Extreme weekly averages: Lowest		Range of weekly averages	
	s.	d.	s.	d.	s.	d.	s.	d.
[1]1842	57	3	65	8	46	10	18	10
1843	50	1	61	2	45	5	15	9
1844	51	3	56	5	45	1	11	4
1845	50	10	60	1	45	0	15	1
1846	54	8	62	3	45	1	17	2
1847	69	9	102	5	49	6	52	11
1848	50	6	56	10	46	10	10	0
1849	44	3	49	1	38	9	10	4
1850	40	3	44	1	36	11	7	2
1851	38	6	43	6	35	6	8	0
1852	40	9	45	11	37	2	8	9
1853	53	3	73	7	43	3	30	4
1854	72	5	83	3	52	5	30	10
1855	74	8	83	1	66	6	16	7
1856	69	2	77	10	59	8	18	2
1857	56	4	63	10	47	5	16	5
1858	44	2	48	8	40	0	8	8
1859	43	9	54	4	39	10	14	6
1860	53	3	62	11	43	6	19	5
1861	55	4	61	6	50	0	11	6
1862	55	5	62	1	45	7	16	6
1863	44	9	48	4	39	10	8	6
1864	40	2	44	1	37	10	6	3
[2]1865	41	10	46	11	38	2	8	9
1866	49	11	61	7	44	5	17	2
1867	64	5	70	5	59	3	11	2
1868	63	9	74	7	49	5	25	2
1869	48	2	54	2	43	5	10	9
1870	46	11	54	11	40	7	14	4
1871	56	8	60	0	52	6	7	6

[1] From 290 towns, by Act of 5 & 6 Vict. c. 14, which came into force on April 29, 1842.
[2] From 150 towns, by Act of 27 & 28 Vict. c. 87, which came into force on January 1, 1865.

Average Prices of English Wheat—*continued*

Year	Annual average		Extreme weekly averages — Highest		Extreme weekly averages — Lowest		Range of weekly averages	
	s	*d*	*s*	*d*	*s*	*d*	*s*	*d*
1872	57	0	60	3	53	11	6	4
1873	58	8	64	7	54	7	10	0
1874	55	9	63	9	43	5	20	4
1875	45	2	53	10	40	11	12	11
1876	46	2	50	8	42	8	8	0
1877	56	9	68	9	50	1	18	8
1878	46	5	52	4	39	0	13	4
1879	43	10	50	5	37	7	12	10
1880	44	4	48	4	39	5	8	11
1881	45	4	55	2	40	9	14	5
1882	45	1	51	3	39	2	12	1
[1]1883	41	7	43	10	39	0	4	10
1884	35	8	39	0	30	5	8	7
1885	32	10	38	1	30	2	7	11
1886	31	0	33	11	29	0	4	11
1887	32	6	36	4	28	5	7	11
1888	31	10	38	1	30	0	8	1
1889	29	9	31	2	27	11	3	3
[2]1890	31	11	36	6	29	8	6	10
1891	37	0	41	8	32	3	9	5
1892	30	3	36	4	25	8	10	8
1893	26	4	27	10	24	8	3	2
1894	22	10	26	4	17	6	8	10
1895	23	1	26	5	19	9	6	8
1896	26	2	33	4	22	4	11	0
1897	30	2	34	4	26	6	7	10
1898 (*first half year*)	—		48	1	34	6	13	7

[1] From 187 towns, set forth by Order in Council (under Act of 45 & 46 Vict c 37) of February 14, 1883

[2] From 196 towns, set forth by Order in Council (under Act of 45 & 46 Vict c 37) of March 21, 1890, taking effect on April 12, 1890

NOTE.—1846, Repeal of the Corn Laws 1854-6 Crimean War 1861-4 American Civil War 1870, Franco German War. 1898, War between Spain and the United States

INDEX NUMBERS OF THE PRICES OF COMMODITIES, MAY, 1898.[1]

THE changes in the prices of certain products since the outbreak of hostilities between the United States and Spain are set forth in the subjoined letter, communicated by Mr. A. Sauerbeck to *The Times* of June 11, 1898:—

"The following are the index numbers of the prices of forty-five commodities, the average of the eleven years 1867–77 being 100:—

1878–87	79	1895	62	1897. September	63·4
1888–97	67	1896	61	1897. December	62·4
	—	1897	62	1898. March	63·0
1889	72			1898. April	65·5
1893	68	1893. December	67·0	1898. May	66·4
1894	63	1896. July	59·2		

"The index number is the highest since the end of 1893, and the advance during last month (May, 1898) is mainly due to wheat, oats, and Manila hemp. The following figures give a comparison of the prices of my standard descriptions of wheat and flour:—

—	Wheat, English, *Gazette*	Wheat, American	Flour, Town-made White
	shillings per qr.	shillings per qr.	shillings per 280 lb.
Average, 1867–77	54½	56	46
„ 1878–87	40	43½	34½
„ 1888–97	29	32	27½
Lowest, October 1894	17½	21	20½
End May, 1898	47¾	50	43

"The price of English wheat in 1894 was, however, much affected by the damp condition of the crop. Prices are now declining, and December futures are as low as 32*s.* to 33*s.* for American. Manila hemp rose from 19*l.* in March to 26*l.* in April, and 37*l.* 10*s.* in May. Maize lost again the advance of the previous month. For most of the other articles there was not much change. Animal food products were a little lower; sugar was somewhat higher. Iron and cotton remained unchanged; tin, tallow, and petroleum advanced; and wool and copper declined to some extent.

"Taking articles of food and materials separately, the index numbers compare thus:—

—	Dec. 1893	July 1896	Sept.	Dec. 1897	April	May 1898
Food	69·5	60·0	67·5	66·5	70·7	71·5
Materials	65·3	58·6	60·4	59·4	61·7	62·7

[1] See Journal, this volume (Part I.), p. 187.

"Articles of food are now 2 points higher, and materials $2\frac{1}{2}$ points lower than at the end of 1893. As compared with the lowest period in 1896, there is a rise of 19 per cent. for the former and of 7 per cent. for the latter.

"The prices and index numbers of silver were as follows (60·84*d.* per oz. being the parity of 1 gold to $15\frac{1}{2}$ silver=100):—

End Aug. 1897 .	. $23\frac{7}{8}$ = 39·2	End April 1898 .	. $26\frac{5}{16}$ = 43 2
End Dec. 1897 .	. $26\frac{5}{8}$ = 43·8	End May 1898 .	. $26\frac{7}{8}$ = 44 2"
End March 1898	. $25\frac{11}{16}$ = 42·2		

RECENT AGRICULTURAL INVENTIONS.

The subjects of Applications for Patents from March 7 *to June* 11, 1898.

N.B.—Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application. Year 1898.	Name of Applicant.	Title of Invention.
5828	ABBEY, G. . . .	Seed drills, &c.
5979	SCHUSTER, C. B., & anr.	Threshing machines.
6036	BAMFORD, S. B. & J. .	Chaff cutters and sifters.
6349	JOHNSON, J. Y. (*Halleck, U.S.A.*) . .	Weeding machine.
6435	GELLER, G. . .	Ploughs.
6510	DOBLIN, C. W. . .	Threshing machines.
6528	CHANDLER, A. . .	Protecting plants and seeds from birds, &c.
7311	KELSEY, G. . .	Chaff-cutting machines.
7319	PORTEUS, G. . .	Extracting dust from cut chaff.
7327	BRYAN, T. M. . .	Chaff-cutting machines.
7694	MUIR, J. . . .	Feeding artificial manure to plants.
7796	BRADBURY, J. . .	Trussing and pressing hay, &c.
8396	WORTS, F. . . .	Reaping, binding, &c., machines.
8479	INNES, G. H. & A. M.	Feed webs for chaff-cutters.
8651	MORRIS, O., & others .	Mowing machine.
8802	BENTALL, E. E. . .	Feeding device for chaff cutters.
8851	HALL, A. . . .	Moulding plough shares, &c.
9117	PHILLIPSON, H. E. .	Spraying potatoes.
9242	DAVY, R. . . .	Turnip cutter and cake breaker.
9366	CONNOR, T. . .	Chill ploughs.
10070	POWELL, T. A. . .	Manure, &c., distributor.
10115	FARRIS, G. . .	Reaping and mowing machines.
10235	FARRIS, J. . .	Mowing machines.
10253	BEER, W. . . .	Grain silos.
10990	SCHALK, G. . .	Horse hoes.
11017	CORBETT, W. . .	Root pulpers, &c.
11177	WILSON, S. . .	Mower and reaper racket boxes, &c.
11262	FRYE, C. E. . .	Cutter bars of reapers.
11269	TOMBRINK & anr. .	Mowing and reaping machines.
11339	STANFORD, C. M. .	Seed threshers.

No. of Application. Year 1898.	Name of Applicant.	Title of Invention.
11355	Marshall, J. .	. Safety feed gear for chaff cutters.
11584	Ball, J. & W. .	. Scythes.
11707	Needley, F., & anr.	. Threshing machines.
11810	Charlton, M. W.	. Reaper and binder.
12371	Young, A. R. .	. Seed planting implements.
12398	Lewis, G. . .	. Chaff-cutting machines.
12435	Shuttleworth, A.	. Chaff cutters.
12442	Dauncey, W. .	. Mowing and reaping machines.
12675	Sleep, W. H .	. Cultivators, &c.
12959	Hannaford, R H.	. Threshing machines and straw trussers.
13150	Sandreczki, K.	. Knife-holder for chaff-cutting machines.

Stable Utensils and Fittings—Horse-shoes, &c.

Year 1898.		
5574	Lemon, G. . .	. Horse-shoes.
5662	Wells, E. . .	. Nosebags.
5699	Peters, P. W. .	. Ladies' saddles.
5893	Evans, E. J. .	. Horse-shoes.
5914	Barnes, J., & another	Horse-shoe calks.
6001	Bednall . .	. Saddle bars.
6236	Cusdin, T., & another	Horse-shoes.
6237	,, ,,	. Horse-shoes.
6340	Saxton, L. D. .	. Horse-shoes
6556	Rathbone, F. .	. Harness saddles.
6696	Radford, J. F.	. Roughing device for horse-shoes.
6973	Wallace, J. B.	. Horse-shoes.
7009	Gulline, H. L.	. Horse-collars.
7153	Miller, C. F., & anr.	Bits and reins.
7337	Lansdown, C. .	. Nosebag.
7444	MacMunn, E. A.	. Horse-shoes.
7464	Edwards, E. .	. Tightening girths of saddles.
7531	Clarke, W. J. .	. Nosebag.
7629	Beckwith, J. J.	. Combined nosebag and halter.
7649	Vezin, H. (*Routh, U.S.A.*) . .	. Bits.
7666	Christy, E. .	. Stirrup.
7801	Schmahl, K. .	. Fastening animals in stables.
7833	Hibbert, B. .	. Nosebag.
7892	Swann, N. B. .	. Nosebag.
7922	Fitter, J. H. .	. Horse-shoes.
8126	Cooper, O. .	. Nosebags.
8199	Uwins, F. .	. Horse collar and saddle.
8376	Hannay, D. F. .	. Bridles, &c.
8451	Spence, D. .	. Combination collar and hames.
8573	Lack, F. E., & others	Coupling trace or tug to whippletree.
8637	West, J. . .	. Nosebags.
8672	Evans, T. L. .	. Reins.
8777	Peters, M., & others.	Horse-shoes.
8863	Clair, P. . .	. Nose nippers for stopping horses from bolting.
8879	Fry & Barnes .	. Pneumatic detachable lining to horse collars.
8938	Thomas, A. G. .	. Trace or tug.
9081	Brown, G. T. .	. Nosebag.
9140	Daws, G. . .	. Nosebag.
9184	Jobban, J., & others	. Horse-shoe.

No. of Application. Year 1898.	Name of Applicant.	Title of Invention.
9186	Perkins, T. C., & ors.	Nosebag.
9207	Cooper, W.	Cribbing muzzle.
9284	Russell, A. C.	Stirrup bar.
9363	Farn, W., & another	Rein.
10411	Howell, A.	Stopping runaway horses.
10698	Wetherd, E R.	Bitless bridles.
10955	Entwistle, A., & anr.	Hames.
11093	Edwards, T.	Coupling hooks for bits.
11114	Marsh, F.	Attachment for horse collars.
11469	Blamey, J.	Nosebag.
12039	Lake, H. (*Wesselmann, Germany*)	Horse-shoes.
12080	Kampe, F. H.	Exchangeable roughing cogs.
12094	Handsley, W.	Crutches for ladies' riding saddles.
12554	Fairweather, W. (*Fessenden, U.S A.*)	Horse-collars.
12834	Howells, W. J.	Horse-shoes.

Carts and Carriages.

Year 1898.		
6701	Campbell, D.	Tip carts or waggons.
11587	Wandsworth, R.	Tumbler carts.
12417	The Bristol Wagon and Carriage Works, Ltd., & others	Waggons, carts, &c.
12976	Holland, F.	Appliance for preventing horse moving cart when left unattended.
13139	Wedlake, T. W.	Reducing friction in axles of carts, &c.

Dairy Utensils, &c.

Year 1898.		
5602	Grayson, T.	Milk-churn lids.
6107	Jones, J. D.	Churn.
6123	Hewlett, R. T.	Sterilising milk.
6706	Owen, T.	Churn.
6830	Berghmark, C. S.	Churns
7371	Eves, T., & another	Preserving milk.
7760	Thompson, W. P. (*Daseking, Germany*)	Centrifugal milk separators.
7883	Parkinson, R, & anr.	Appliance for securing milk-cans to street doors.
8174	Smith, T.	Milk churns.
8668	Bourke, W. L.	Cooling milk.
8831	Timm, T.	Dairy strainer.
9191	Flynn, J.	Butter plough.
10116	Rudge, J.	Bowls for centrifugal cream separators.
10439	Edwards, J.	Milk pails.
10801	Robotham, C. H.	Holder for milk-churn labels.
10978	Persoons, J. F.	Cream separators.
11207	Eyssen, J. H.	Keeping and packing cheese.
11311	Dibbern, I.	Milk receiving and delivering apparatus.

No. of Application. Year 1898.	Name of Applicant.	Title of Invention.
11991	LANE, F. W.	New sterilising milk churn.
12869	BENDIXON, N.	Sterilising milk.

Poultry and Game, &c., Appliances

Year 1898.		
6099	TAWSE, J.	Appliances for rearing chickens.
6393	PEBERDY, T., & anr.	Preserving eggs.
6507	JAMES, A.	Incubators.
6508	"	Chicken rearer.
6509	"	Foster mother.
6681	BLAKE, A. J.	Brooder or foster mother.
6895	MACKINTOSH, I. B.	Incubators and foster mothers.
7511	STANCLIFFE, C. W.	Chicken coop and run.
8370	PHILLIPS, H. J.	Poultry houses.
8464	HODGES, H. N.	Chicken and game rearer.
10380	WILSON, R.	Safety egg-box.
11018	SWAN, J.	Treating eggs.

Miscellaneous.

Year 1898.		
6030	BOOTH, J.	Cattle food containing "melasse"
6312	HOBBS, W. J.	Feeding rack and trough combined.
8080	PEEBLES, T. S.	Compound for preventing growth of horns on sheep and cattle.
12453	SAMS, H J.	Beehives.
12546	PEARSON, J. B.	Combined hay rack and shutter for cattle sheds.
12630	PERRON, G., & anr.	Cattle food.
12685	THOMPSON, G. F. (*Cochran, U.S.A.*)	Cattle food.
12921	MATTHEWS, H. F., & another	Bar frames for beehives.

Numbers of Specifications relating to the above subjects published since March 5, 1898.[1]

(Price 8d. each copy.)

Specifications of 1897.

7422, 9000, 9128, 9247, 9744, 10766, 10920, 11426, 11610, 12948, 13142, 13285, 14399, 14604, 16466, 18227, 18788, 20474, 30402, 30817, 30839.

Specifications of 1898.

234, 1028, 1773, 2230, 3384, 3491, 4338, 4616, 5000, 5041, 5380, 5699, 5914, 6038, 6236, 6237, 6340, 6349, 6696, 6830, 6973, 7009, 7666, 8011, 8126 8144, 9507.

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[1] Copies may be obtained at the Patent Office (Sale and Store Branch) Quality Court, Chancery Lane, London, E.C.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

THE BIRMINGHAM MEETING, 1898.

At the time when the Report on the Manchester Meeting was published in the Journal, a year ago, the preliminary arrangements were in progress for the holding of the Country Meeting of 1898 at Maidstone. But at the meeting of the Council held on November 3, 1897, it was found necessary, for reasons then stated, to postpone the gathering in the county town of Kent till 1899, and at the next meeting of the Council, on December 8, it was announced that an invitation to hold the Show of 1898 in the neighbourhood of Birmingham had been accepted. The necessity of postponing the Meeting at Maidstone for one year arose out of circumstances quite beyond the Society's control, and prepared the way for the cordial invitation, personally preferred by the Lord Mayor of Birmingham, to the Society to pitch its camp in the summer of 1898 near the metropolis of the Midlands. It so happens that Birmingham, like Manchester and Liverpool, is not included in any of the Districts into which the country is divided for the purpose of the Society's Annual Meetings, so that the rotation or sequence of these Districts was not interfered with. The recollection of the success of the only previous Meeting at Birmingham, in 1876,—when, however, the Show was held in the easily accessible Aston Park,—was a further inducement to get over the Maidstone difficulty in the manner decided upon.

Although Birmingham has since 1892—as recorded in the Journal of that year (3rd series, vol. iii., p. 363)—been, as it may be termed, "ex-territorial," this year's gathering must none the less be regarded as a Warwickshire Meeting. As such it marks the fourth visit of the Society to the beautiful county which occupies the "heart of England." It may, therefore, be of interest to

furnish, as in the subjoined statement, a few brief details of the four Meetings that the Society has held in Warwickshire:—

Year	Place of Meeting	President	Entries of Live Stock	Number of Implements entered	Persons paying for admission
1859	Warwick	Duke of Marlborough	1,159	4,618	55,577
1876	Birmingham	Lord Chesham	1,499	6,414	163,413
1892	Warwick	Earl of Feversham	1,864	5,430	96,462
1898	Birmingham	Earl Spencer	2,323	4,938	98,277

The Show-Ground.

An admirable site for the Show-ground was found in Four Oaks Park, Sutton Coldfield, amid some of the most charming scenery in Warwickshire. The distance from Birmingham (New Street Station) was 9 miles, and from Lichfield 7 miles. An area of 98 acres was occupied by the Show-ground, the entrance gates of which were 600 yards from Four Oaks Station on the line (London and North-Western Railway) from Birmingham to Lichfield, and 1,160 yards from Sutton Park Station (Midland Railway). The ground was peculiarly well adapted for the purpose of a great show, and the Society has rarely, if ever, occupied a better site. The general disposition of the yard is shown on the plan at pp. 436–7. The ground rose at a gentle declivity from the entrances to the broad avenue extending transversely across the yard. At the middle of the avenue Four Oaks Hall was conveniently situated, and afforded the accommodation which is usually provided by the erection of the Royal Pavilion and Stewards' Pavilion. Magnificent views of well-wooded country were obtainable from the transverse avenue, and still more from the grand stand at the large ring. The surface of the ground could hardly have been improved upon, for it was in no way impaired by the considerable quantity of rain that fell.

Entries.

On the opposite page is a statement of the entries in all sections of the Exhibition in this and each of the immediately preceding nine years.

Though there was not a record entry in any of the live stock departments, it is seen that each section filled up well above the average of recent years, whilst over the decade the Birmingham total of 2,323 has been exceeded only at the great Meetings at Manchester last year, and at Windsor in 1889,

both of which were of an exceptional character. On the other hand, poultry made a record entry, with a total only three dozen short of a thousand. The entries of produce rank fourth amongst the ten years' totals.

Number of Entries at the last Ten Country Meetings (1889–98).

Number of Animals or Pens entered	Birmingham, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895	Cambridge, 1894	Chester, 1893	Warwick, 1892	Doncaster, 1891	Plymouth, 1890	Windsor, 1889
Horses	709	951	594	650	617	509	447	713	298	968
Cattle	792	821	594	548	659	758	605	661	642	1,637
Sheep[1]	624	701	551	505	588	631	610	643	571	1,106
Pigs	198	155	144	—	—	161	202	204	223	265
TOTAL	2,323	2,688	1,883	1,703	1,864	2,059	1,864	2,221	1,764	3,976
Poultry	964	837	901	769	705	836	836	800	695	862
Produce	635	715	574	476	[illegible]	957	423	425	456	1,208

Shedding in Implement Yard (in feet) [exclusive of open-ground space]	Birmingham, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895	Cambridge, 1894	Chester, 1893	Warwick, 1892	Doncaster, 1891	Plymouth, 1890	Windsor, 1889
	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.	ft.
Ordinary	9,350	9,320	8,506	7,528	8,455	8,610	8,241	8,043	6,117	10,378
Machinery in motion	3,239	3,324	2,732	2,718	2,519	2,211	2,151	2,106	1,291	2,496
Special shedding (including seeds, models, &c.)	2,902	2,978	2,692	2,351	2,428	2,197	2,119	2,024	1,670	2,728
TOTAL	15,491	15,622	13,930	12,597	13,402	13,018	12,511	12,173	9,078	15,602
No. of Implement Stands	502	489	450	393	442	408	411	421	307	553

[1] Including 52 entries of goats in 1897, 14 in 1892, and 27 in 1889.

The space allotted to implements, extending to 15,491 feet, fell only very slightly short of the memorable displays of 1889 and 1897, and the special shedding, it will be noticed, established a record.

1876 AND 1898—A COMPARISON.

The totals of entries at the two Birmingham Meetings are tabulated on the next page. The increases this year in the numbers of horses, cattle, and sheep are very pronounced. It is doubtless on account of the difficulties in dealing with swine

fever during recent years that the entries of pigs in 1898 show nothing beyond the most trivial increase over those in 1876. That the number of implement stands should have increased whilst the total of implement exhibits has declined is only an apparent anomaly, and is easily explained by the circumstance that this year the exhibits in the special shedding were for the first time grouped together, and were not catalogued under separate numbers.

Comparison of Entries at the Two Birmingham Meetings, 1898 *and* 1876.

Section	1898	1876	1898 compared with 1876	
			Increase	Decrease
	No.	No.	No.	No.
Horses	709	424	285	—
Cattle	792	474	318	—
Sheep	624	407	217	—
Pigs	198	194	4	—
Poultry	964	—	964	—
Produce	635	81	554	—
Implement stands . . .	502	420	82	—
Exhibits	4,938	6,414	—	1,476

A more detailed comparison of the entries at the two Meetings is afforded by the table opposite. The prize money offered this year for live stock, poultry, and produce amounted to 6,305*l*., or 2,028*l*. more than in 1876, the increase being nearly 50 per cent. The total entries in the sections named were 3,922 in 1898, and 1,580 in 1876, an increase of nearly 150 per cent. In the Horse section Shires were not specifically classified in 1876, nor were any classes assigned to Cleveland Bays, Coach Horses, Ponies, and Polo Ponies. The Welsh, Red Polled, Aberdeen Angus, Galloway, Ayrshire, Kerry, and Dexter breeds of cattle found no place in the Catalogue of 1876. More than half the breeds of sheep for which pens were provided this year were unrepresented at the former Meeting, which moreover was held at a time before the Tamworth breed of pigs had secured separate recognition. No provision was made for poultry in the Show of 1876, but wool had two classes allotted to it. A solitary class was assigned to butter in 1876, and two classes to cheese, the one for "over 6 inches in thickness," and the other for "not exceeding 6 inches in thickness."

A conspicuous feature of the Meeting of 1876 was afforded in the trials of reaping machines, which were at that time

COMPARATIVE STATEMENT OF ENTRIES, &c.,

AT THE TWO MEETINGS HELD AT BIRMINGHAM IN 1876 AND 1898.

		1876 (July 7-24)	1898 (June 18-24)
IMPLEMENTS	Stands	420	502
	Prizes offered	*£150*	*£310*

Horses, Cattle	1876		1898	
	Classes	Entries	Classes	Entries
HORSES:—				
Prizes	—	*£1,585*	—	*£2,416*
Hunters	11	127	13	157
Cleveland Bays	—	—	4	22
Coach Horses	—	—	4	18
Hackneys	6	55	11	103
Ponies	4	32	5	42
Mountain, &c., Ponies	—	—	2	23
Polo Ponies	—	—	10	69
Harness Horses	4	25	3	40
Shire	(*See Agricult.*)		10	135
Clydesdale	5	28	6	34
Suffolk	5	35	6	39
Agricultural	8	122	4	27
Draught Horses	—	—		
Total for HORSES	43	424	78	709
CATTLE:—				
Prizes	—	*£1,430*	—	*£1,716*
Shorthorn	8	148	7	188
Hereford	8	75	7	60
Devon	8	56	6	38
Sussex	6	35	5	28
Longhorn	5	53	3	22
Welsh	—	—	5	21
Red Polled	—	—	5	27
Aberdeen Angus	—	—	5	56
Galloway	—	—	5	24
Ayrshire	—	—	5	19
Jersey	4	77	5	158
Guernsey	3	9	5	79
Kerry	—	—	2	18
Dexter	—	—	2	22
Dairy Cattle	2	21	4	32
Total for CATTLE	44	474	71	792

Sheep, Pigs, Poultry, Produce	1876		1898	
	Classes	Entries	Classes	Entries
SHEEP:—				
Prizes	—	*£840*	—	*£1,275*
Leicester	3	37	5	35
Cotswold	3	36	5	32
Lincoln, &c.	3	61	6	75
Oxford Down	3	41	5	44
Shropshire	7	167	7	147
Southdown	3	50	5	84
Hampshire Down, &c	3	15	5	59
Suffolk	—	—	5	13
Border Leicester	—	—	5	36
Somerset and Dorset	—	—	2	6
Kentish	—	—	2	27
Wensleydale	—	—	2	18
Cheviot	—	—	2	8
Black Faced Mountain	—	—	2	12
Lonk	—	—	2	6
Herdwick	—	—	2	6
Welsh Mountain	—	—	2	16
Total for SHEEP	25	407	64	624
PIGS:—				
Prizes	—	*£300*	—	*£389*
Large White	4	35	4	54
Middle " (*See Other*	*Breeds*)	—	4	31
Small "	4	51	4	16
Berkshire	4	53	4	53
Tamworths (*See Other*	*Breeds*)	—	5	44
Small Black	4	29	—	—
Other Breed	4	26	—	—
Total for PIGS	20	194	21	198
	Classes	Entries	Classes	Entries
TOTAL FOR STOCK	132	1,499	234	2,323
POULTRY:—				
Prizes	—	—	—	*£257*
Entries	—	—	92	964
PRODUCE:—				
Prizes	—	*£122*	—	*£252*
Entries	5	81	35	635

Grand Totals for LIVE STOCK, POULTRY, and PRODUCE				
1876	137 Classes	1,580 Entries	£4,527[1] Prizes
1898	*361* "	*3,922* "	*£6,337*[2] "

[1] Including £250 for Farm Prizes.

[2] Including £32 offered for Horse-Shoeing Prizes.

coming prominently into notice. Prizes were awarded in four classes: (1) for reaping machine, with self-delivery in sheaf, clear of the horse-track; (2) for reaping machine, with self-delivery in swathe, clear of the horse-track; (3) for combined reaping and mowing machine, without self-delivery; (4) for one-horse reaping machine. In the department of Miscellaneous Implements the Society's Silver Medals were awarded in 1876 to three appliances: a potato digger, a caloric engine, and an adaptation of a band-cutter to a self-feeder for a corn-threshing machine. At this year's Meeting the implement trials were concerned with self-moving vehicles (see p. 460), and with the best methods of safeguarding chaff cutters (see p. 509). In the miscellaneous section four Silver Medals were awarded for appliances which are described in the Report at p. 491.

The Birmingham Meeting of 1876 required the services of 39 Judges of live stock and produce, and 6 Judges of implements. At the recent Show the corresponding numbers were 96 and 5 respectively.

The Show.

In conformity with the usual custom, only the Implement Yard and the Dairy were open to the public on Saturday, June 18. At the Dairy Miss M. A. Johnstone commenced a series of demonstrations of the making of butter, cream cheese, and fancy cheese, and these were repeated day by day. An innovation which was found to work satisfactorily was the judging of the butter and cheese classes, and of the cider and perry classes, on this day, thereby to some extent relieving the very heavy programme of work for the following Monday.

Divine service was held on Sunday morning in the large tent, which proved none too capacious for the herdsmen, shepherds, and other attendants on live stock, besides whom many members of Council, including the President, were present. The service was choral, and the sermon was preached by the Bishop of Coventry from the text—1 Samuel xv. 14: "What meaneth then this bleating of the sheep in mine ears, and the lowing of the oxen which I hear?"

On Monday at 8.30 A.M. another gathering took place in the large tent, this time of the Stewards and Judges of live stock, who were briefly addressed by the Hon. Cecil T. Parker, Honorary Director of the Show. In bidding the company farewell at the close of his six years' tenure of office, Mr. Parker availed himself of the opportunity of introducing his successor, Mr. Crutchley, who was present on the platform. By nine o'clock the important work of the day had commenced in the

numerous judging rings, and the awards were posted with considerable promptitude. Demonstrations of bee driving and lectures on bee management were given on this and the succeeding days.

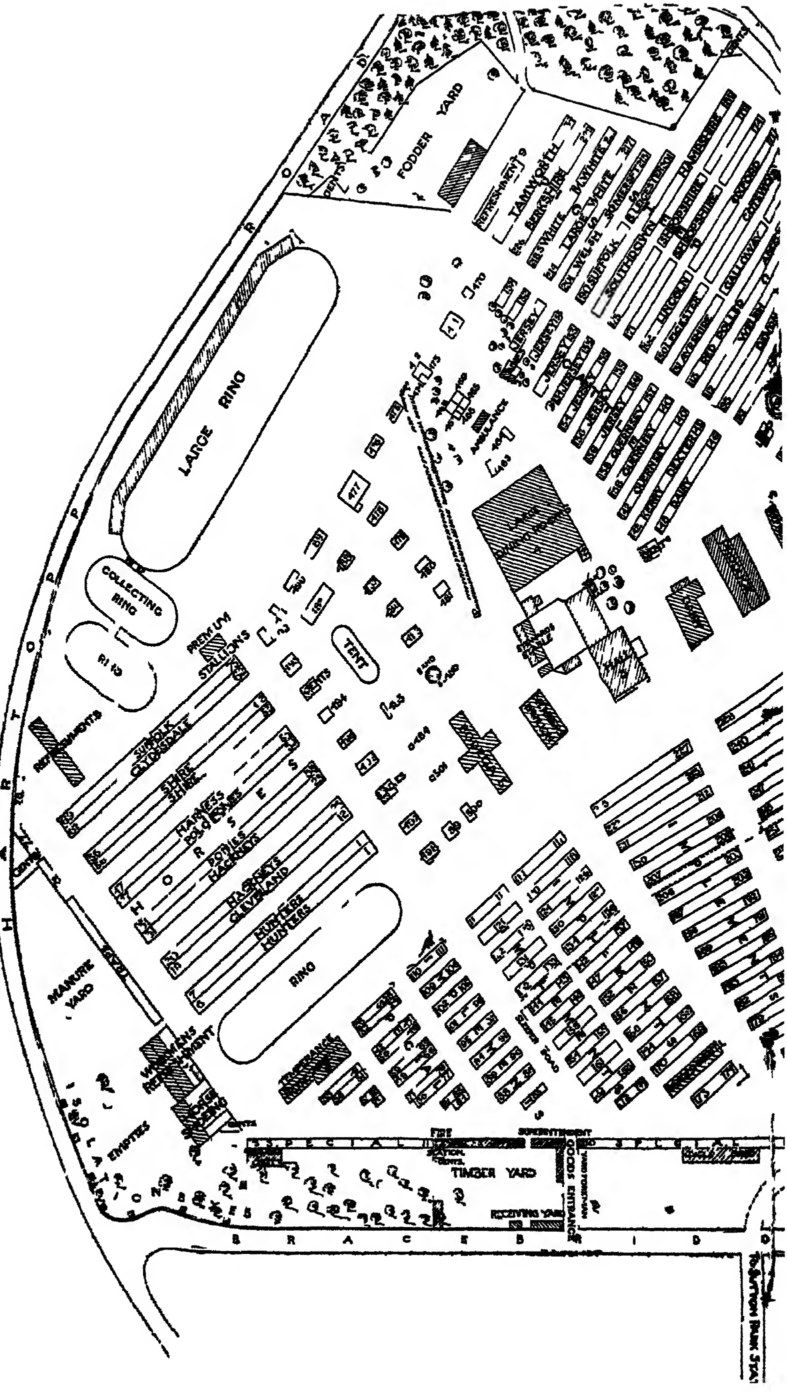
Tuesday's business began with the judging of Polo Ponies and of Harness Horses and Ponies, as had been arranged for this day. Parades took place, in the large ring, of cattle and heavy horses in the morning, and of Hunters, Hackneys, and other light horses in the afternoon; these were repeated on the three following days. The demonstrations, twice daily, of the cramming, plucking, and trussing of poultry for the table, by Mr. Edward Brown, also commenced.

Unusual interest attached to the customary General Meeting of Governors and Members of the Royal Agricultural Society, which was held in the large tent on Tuesday. The chair was occupied by Earl Spencer, K.G., as President of the Society, and amongst those supporting his Lordship was the Earl of Coventry, President-elect. The special feature of the gathering —a report of which appears in the Appendix (p. lxxxix)—was the presentation made to the Hon. Cecil T. Parker, as some recognition of the valuable services he had rendered the Society in the capacity of Honorary Director. On this and the remaining days of the Show the band of the 2nd Battalion Bedfordshire Regiment played selections of music, the programme of which was printed in the Catalogue.

On Wednesday the Prince of Wales honoured the Show with his presence. His Royal Highness, accompanied by the President and the Earl of Warwick, drove on to the ground shortly after midday, being received at the gates by the Honorary Director, and at Four Oaks Hall by the Council of the Society. In all parts of the Showyard His Royal Highness met with a cordial reception, especially at the grand stand, which was crowded during the afternoon parade of horses.

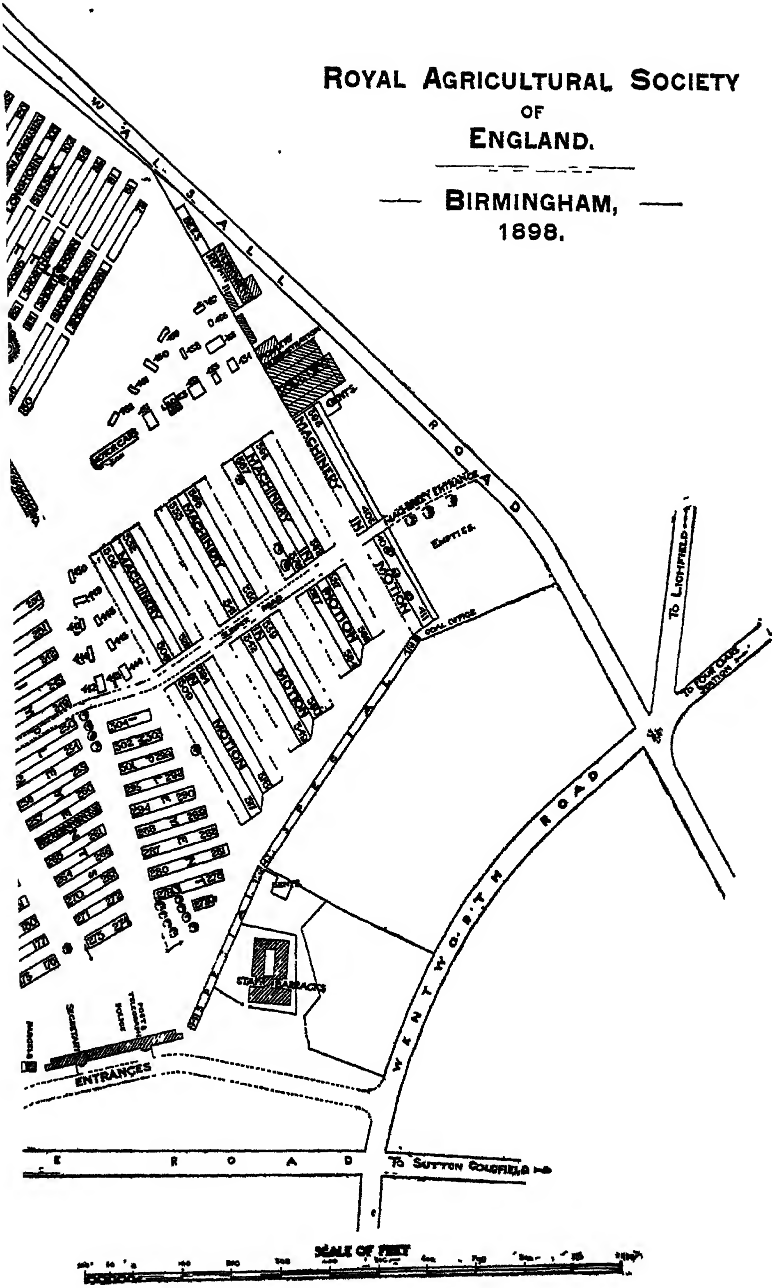
The judging of Draught Horses in Harness (see p. 443) was reserved till the morning of Thursday. An additional interest was given to the day's proceedings by the inclusion, in the parade, of a selection of the powerful draught horses which had been used for the purposes of the Show by the London and North-Western and the Midland Railway Companies.

The weather record of the Meeting was a broken one, the conditions having been less settled perhaps than in any year since the Society first began in 1889 to hold its annual gathering in June instead of July. Sunshine attended the first opening of the turnstiles on the Saturday morning, but in the


LARGE RING
COLLECTING RING
FODDER YARD
TENT
RING
MANURE YARD
TIMBER YARD
RECEIVING YARD
AMBULANCE
TAMWORTH
JERSEY
GUERNSEY
DEXTER
KERRY
LINCOLN
GALLOWAY
SUFFOLK
CLYDESDALE
SHIRE
HARNESS
PONIES
HACKNEYS
CLEVELAND
HUNTERS
STALLIONS
REFRESHMENTS

Royal Agricultural Society of England.

Birmingham, 1898.



afternoon some heavy showers of rain swept across the yard. Sunday was fine, and Monday, the "judging day," was the finest, and altogether the most pleasant, day of the week. A dull morning on Tuesday gave place to a wet afternoon, a few gleams of sunshine intervening between the showers. The sunny weather of Wednesday morning was followed by showers in the afternoon, and by a heavy thunderstorm with hail just before the gates closed. The weather was fine on Thursday, but the closing day, Friday, June 24, was not an unchequered Midsummer Day, though the rain fell only at intervals in showers of brief duration.

The Table of Attendances given below shows clearly enough how the disappointing aggregate of only 98,277 visitors—as compared with 163,413 at the Birmingham Meeting of 1876—may be accounted for. The wet weather of Tuesday was undoubtedly the chief cause of the marked falling-off in the number of visitors on the first half-crown day. The hope that the receipts might still be brought up to a remunerative level by big attendances on the two days of popular prices was doomed, as the figures indicate, to grievous disappointment. For this the unsatisfactory manner in which the passenger traffic was managed on the London and North Western Railway system between Birmingham and Four Oaks must, to a large extent, be held responsible. The circumstances which contributed to the unfortunate financial result are referred to in the Proceedings of the Council, at p. lxxxi. of the Appendix.

Number of Paying Visitors at the last Ten Country Meetings (1889–98).

Day of Show	Birmingham, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895	Cambridge, 1894	Chester, 1893	Warwick, 1892	Doncaster, 1891	Plymouth, 1890	Windsor, 1889
Implement day (2s. 6d.)	236	—	172	574	200	299	266	344	194	493
1st day (5s.)	2,462	4,547	1,901	2,172	1,570	2,397	3,570	2,651	1,234	6,223
2nd day (2s. 6d.)	10,492	22,418	17,401	12,046	13,152	20,959	16,598	12,331	10,008	18,809
3rd day (2s. 6d.)	22,317	21,473	21,7[illegible]5	24,942	17,890	19,034	15,779	18,530	39,308[1]	24,690
4th day (1s.)	49,011	73,11[illegible]	80,[illegible]2	43,073	63,981	59,535	36,448	57,580	32,371	32,965[2]
5th day (1s.)	13,739	73,902	24,558	17,503	14,496	13,664	23,801	20,034	14,026	44,498
Total	98,277	217,98[illegible][3]	146,277	100,310	111,658	115,908	96,462	111,500	97,141	155,707[4]

[1] The third day was a 1s. day at Plymouth.
[2] The fourth day was a 2s. 6d. day at Windsor.
[3] Including 22,0[illegible] on the sixth day (1s.).
[4] Including 28,034 on the sixth day (1s.).

In proceeding to notice the various departments of the Exhibition, it should be mentioned that the views of the Judges of the several sections are incorporated in the details which follow. The names of the Stewards and of the Judges, with the full official List of Awards, will be found in the Appendix, at

p. xcv. This list furnishes all essential particulars concerning the ownership, breeders, and parentage of the prize animals, so that it is unnecessary to repeat these in the text.

Horses.

The total entries of horses, numbering 709, compared favourably with the entries in the three years immediately preceding the Manchester Meeting. Hunters furnished the largest entry, and Shires came next, as will be learnt from the Table subjoined. The results of the veterinary inspection of the horses form the subject of a report given in the Appendix, at p. lxxviii.

Entries of Horses at the last Five Country Meetings, 1894–98.

—	Birmingham 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895	Cambridge, 1894
Prizes offered	£2,416	£3,588	£1,880	£2,012	£1,872
	No.	No.	No.	No.	No.
Hunters	157	197	164	173	55
Cleveland Bays	22	23	19 (Cleveland Bays and Coach Horses)	48	15 (Cleveland Bays and Coach Horses)
Coach Horses	18	17		34	
Hackneys	103	183	93	106	167
Ponies	42	79[1]	27	18	15
Mountain and Moorland Ponies	23[1]	—	—	—	—
Polo Ponies	69	95	—	—	—
Shetland Ponies	—	—	—	15	—
Pit Ponies	—	—	—	11	—
Harness Horses and Ponies	40	73	27	20	25
Shires	135	172	173	95	198
Clydesdales	34	51	27	70	29
Suffolks	39	44	28	34	103
Rulley Horses	—	—	—	5	—
Draught Horses / Agricultural Geldings	27	47	36	21	10
Total Entries of Horses	709	981	594	650	617

[1] Including Shetland Ponies.

Light Horses.

Hunters.—The 157 entries were distributed over thirteen classes, the largest of which, with 19 entries, was Class 5, Hunter mare or gelding, 13 st. 7 lb. to 15 st. In the case of Class 2 the Judges testify to the calibre, the high quality, and the suitability for breeding hunters of more than half the exhibits, whilst only one of the seven selected animals was rejected in the veterinary examination. Class 4 was very fair, many of the horses showing quality. Class 5 proved strong,

both in point of numbers and of qualification for the hunting-field; the prize-winners were up to considerably more than the minimum weight (13st. 7lb.) stated in the conditions. Class 6 was decidedly weak, though the winner did something towards retrieving its character. Class 8 was good, several geldings showing quality, action, and merit. Class 9 was small, but both breeding and merit were found in the prize-winners. Class 11, though it brought out some fairly good fillies, could not be described as a strong one, there having been nothing worthy of notice beyond the three winners. Class 12 was poor, and included only one animal of the requisite type. Class 13 contained animals of some promise, and taken as a whole was a decided improvement upon the preceding class. The Judges of Classes 2, 5, 6, 11, 12, and 13, remark:—

Taking a purview of the horses under four years old, on which we were called upon to pass judgment, the feature that impressed itself upon our minds the most forcibly was that the majority of them had badly placed shoulders, were lamentably deficient in bone, in hunter-like construction, and in action; and, one would suppose, must be the produce of mares vastly inferior in these essential points to the brood mares exhibited in Class 2.

On the other hand, the older horses, if Class 6 be excepted, were thoroughly representative of the class of hunter most in demand at the present time.

Cleveland Bays.—The 22 entries were only one less than at Manchester. The stallion classes (14 and 15) were excellent, and the mares and foals (Class 16) good representatives of the breed, whilst the fillies (Class 17) showed great promise.

Coach Horses.—The 18 entries were 1 more than at Manchester. Despite the smallness of each of the four classes, quality and general excellence were not wanting.

Hackneys.—The entries were numerically not quite up to the average of the four or five preceding years. They numbered 103, arranged in 11 classes, the largest being Class 29, yearling fillies, with 18 entries. The 27 class prizes that were awarded went amongst the produce of 22 different sires. Of these *Garton Duke of Connaught* stands first, with two first prizes and two thirds to his credit, whilst *Danebury* is represented by one first and one third. Eight sires figure in the list for one first prize each—*Anconeus 2nd*, *Chocolate Junior*, *Connaught*, *Contest*, *Danegelt*, *Grand Master 2nd*, *Lord Denby 2nd*, *Saxon*. Two second prizes went to offspring of *Ganymede*, one second and one third to offspring of *Clovelly*, whilst *Agility*, *Goldfinder 6th*, *Houndales*, *Old Times*, *Polonius*, and *Rufus* are represented by one second prize each. *Rosador* is credited with two third prizes, and *All Fours*, *Confidence*, and *Fireaway 5th*

each with one third. The number of winning sires is proportionately larger than usual—that is, the prizes are more widely distributed.

The Judges found most of the Hackney classes well filled, and the animals generally possessing shape, quality, and action. They were so pleased with the brood mares over 15 hands (Class 26) that, after awarding the three prizes to mares of very rare type, they decided to commend the whole class. The only really disappointing class was that of the yearling colts intended for stallions (Class 25), these being found, as has often been the case, half-ruined by over-indulgence in feeding, and a lack of natural freedom and exercise.

Ponies.—Forty-two entries were about equally distributed over five classes. The stallions (Class 33) included some fairly good animals, but nothing of unusual merit. The brood mares (Class 34) were exceptionally good, the winners having outstanding quality and action. Class 35 was wanting in action, but there were some good animals in Class 36. The first two ponies in Class 37 were fine movers, and the remainder possessed considerable merit.

Mountain Ponies.—The 23 entries comprised 9 stallions (Class 38) and 14 mares (Class 39). The Judges say:—

We are of opinion that these classes should be better supported. Besides ponies from the mountain and moorland, other high-stepping show ponies were exhibited. We had no difficulty in separating the two, and thought it our duty to award the prizes to animals most typical of the respective mountain and moorland breeds. The first and second prize animals in Class 39, representing Welsh and New Forest, were full of quality and of the correct pony type, and such as we suggest should be encouraged. This applies also to Class 38.

Polo Ponies.—This section, inaugurated at the Manchester Meeting last year, attracted 69 entries, which occupied ten classes. Eight of these (Classes 40–47) attained a distinctly good standard, such as should tend to encourage and improve the breeding of Polo Ponies. Classes 48 and 49 (mares or geldings) were poor in numbers and inferior in quality, considering the value of the prizes offered. The Judges attribute this largely to the circumstance that the majority of the owners of ponies, eligible for exhibition in these classes, are playing them at polo at the time of the Show.

Harness Horses and Ponies.—Three classes accommodated 40 entries, of which 7 (Class 52) were ponies. Both horse classes were good, Class 51 exceptionally so; the ponies also made up a strong class.

Thoroughbred Stallions.—Three of the four horses *Alvin*, *Button*

Park, *Pantaloon*, and *Q.C.*, which won the Queen's Premiums awarded in 1898 by the Royal Commission on Horse Breeding in connection with District F—the counties of Gloucester, Hereford, Monmouth, Salop, Stafford, Warwick, Worcester, and South Wales—were exhibited, not for competition, in a special shed; the absentee was *Pantaloon*. See Appendix, p. xcix.

Heavy Horses.

Shires.—The entries, 135 in number, fell slightly below the average of recent years. They occupied 10 classes, the largest of which was Class 62, yearling fillies, with 21 entries.

The sires of the prize-winning animals reached proportionately a larger total than is usually the case, the 29 class prizes being distributed amongst the produce of 24 distinct sires. The first place belongs to *Prince Harold*, represented by one first prize, one second, and one third, *Bury Victor Chief* coming next with one first and one third. The following sires have one first prize each to their credit:—*Bold Harold*, *Duke of Clarence II.*, *Duke of Worsley*, *Engineer II.*, *Marleaton Royal Harold*, *Marmion II.*, *Regent II.*, *Rokeby Harold*. Two second prizes are credited to *Calwich Prince*, one second and one third to *Harold*, and one second each to *Coleshill Carbon*, *First Lord*, *The Colonel V.*, *Tudor Harold*, *Twilight*, and *Valesman of Willington*. One third prize each is claimed by *Bar None*, *Cuff Duncan*, *Dunsmore Willington Boy*, *Harold's Pilot*, *Pride of Blagdon*, and *Stonewall*.

In Class 51 the first prize horse (Mr. Henderson's *Buscot Harold*), which was awarded the Shire Horse Society's Gold Medal, is in the Judges' opinion one of the best that has been seen for years, and quite stands out by himself. Class 56, though strong in numbers, was, with one or two exceptions, deficient in quality. The foals (Classes 57 and 58), except the first prize filly, were not good. Class 59 contained some passable mares, especially the first, and Class 60 was very good. Class 61 was exceedingly even, any one of the first six being worthy of a first prize. In Class 62 the winning filly, bred by His Royal Highness the Prince of Wales, "was a marvel as to quality and quantity of bone and substance." Many of the others, however, were of different type and lacking in substance. Class 75 contained many good geldings for working purposes. The Judges of Shires add:—

> As a whole the show was not a good one, we hardly think as good as the average of late years, with the exception of the filly classes.

Clydesdales.—Thirty-four entries were fairly evenly distri-

buted amongst 6 classes. The Judges speak well of every class, and add that the entire section ranked high in point of merit, their only regret being that the classes were not better filled.

Suffolks.—Here again there were six classes, these attracting 39 entries, the best filled being Class 73, three-year-old fillies, with 10 entries. The Judges regret to have not found more animals in the stallion classes. The mares in Class 72 were all good. Of the 10 fillies in Class 73, half-a-dozen were really first class, and there were some smart young fillies also in Class 74.

Draught Horses.—These were contained in Class 75 for draught geldings, with 15 entries, and in Classes 76, 77, and 78 for draught horses in harness, with four entries, one entry, and seven entries respectively. Classes 76 and 77 were for pairs, and Class 78 for single animals. In the three harness classes the animals were exhibited on the Thursday only, being judged in the morning and paraded in the afternoon. Class 75 contained many good geldings for working purposes.

Cattle.

As will be seen from the table on the next page, Shorthorns were easily first in numbers, whilst their total exceeded even the big entry at Manchester in 1897. Jerseys, which rank next, were also entered in greater numbers than in any recent year, as were again the Guernseys. Honour was paid to the locality in providing a section for Longhorns, which had not been seen in the Royal Showyard since the Warwick Meeting of 1892, when, however, there were only 7 entries, as compared with 22 this year. The aggregate entry of Scotch breeds is 99, this total being identical with last year's.

Shorthorns.—The 188 entries occupied seven classes, of which Class 81, yearling bulls, with 47 entries, was the best filled. Subjoined is the Judges' report:—

Class 79.—Bulls calved in 1893, 1894, and 1895 were all forward, with the exception of No. 728, and made a good display. There were very few of these which were not worthy of being exhibited. This class supplied the champion animal in the male classes [Mr. Mills's *Marengo*].

Class 80.—Of the 33 entries there was only one absentee. This was a splendid turn-out, and reflected great credit on the exhibitors. Great difficulty was found in deciding on the merits of the different exhibits. The referee had to be called in to decide in the case of the first and second animals.

Class 81.—Forty-seven entries, seven absentees. This class contained many very useful bulls that did not find their way to the front, but are quite good enough to win in local showyards. On the whole, a splendid class.

Class 82.—Contained 15 entries, 2 absent. The champion female [Mr.

Brierley's *Jewel 2nd* turned up in this class, and is a cow of rare quality with grand milking properties. We noticed a decided improvement in the show of milking properties in many of the animals in this class.

CLASS 83.—A small class, all present, but of no particular outstanding merit.

CLASS 84.—Thirty entries, nine of which were not forward. A strong, good class, difficult to judge, many animals being of splendid quality.

CLASS 85.—Twenty-four entries, eight absent. A very good, strong class. In this we found the reserve champion female, which we consider ran the champion a very close race for premier place. This heifer will no doubt be heard of in the future.

We have great pleasure in congratulating the Society on the excellent show of Shorthorns at their Birmingham Meeting of 1898.

Entries of Cattle at the last Five Country Meetings, 1894–98.

—	Birmingham, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895	Cambridge, 1894
PRIZES OFFERED	£1,716	£2,105	£1,656	£1,740	£1,563
	No.	No.	No.	No.	No.
Shorthorns	188	184	127	124	141
Herefords	60	60	47	50	53
Devons	38	51	26	28	27
Sussex	28	25	27	20	52
Longhorns	22	—	—	—	—
Welsh	21	32	23	8	12
Red Polled	27	38	25	22	60
Aberdeen Angus . . .	56	46	31	60	33
Galloways	24	29	22	46	11
Highland	—	3	6	3	—
Ayrshires	19	21	7	14	7
Jerseys	158	149	130	91	151
Guernseys	79	61	46	32	40
Kerries	18	17	11	13	22
Dexters	22	27	17	14	26
Dairy Cattle . .	32	78	43	23	24
Total Entries of Cattle	792	821	594	548	659

Herefords.—The number of white-faces entered was identical with the Manchester total, the aggregate being 60. Of the seven classes, the largest was Class 88, yearling bulls, with 18 entries. The Judges found the section good throughout, more especially the yearling bulls and the yearling heifers. Fourteen of the former received recognition, whilst of the latter all were noticed except two.

Devons.—Thirty-eight entries occupied six classes, the best filled being Class 91, young bulls, with 10 entries. The animals, as a whole, were of very superior merit, there being hardly a plain one amongst them. The heifer classes in particular showed excellent quality.

Sussex.—Of five classes, which attracted a total of 28 entries,

the largest was Class 102, two-year-old heifers, with 8 entries. The animals were mostly good types of the breed.

Longhorns.—The 22 entries comprised 6 bulls (Class 104), 10 cows (Class 105), and 6 heifers (Class 106), all from local herds. The Judges report:—

CLASS 104.—Bulls of all ages. First prize animal of good Longhorn character. Second prize a good animal, not quite so good in character.

CLASS 105.—Cows and heifers. First prize a good useful cow, with quality; second and third prizes were also useful animals, quite characteristic of their breed.

CLASS 106.—First prize animal a smart heifer, the remainder of the class somewhat ordinary.

Welsh.—Twenty-one entries were distributed over five classes, the largest being Class 111, with five yearling heifers. The entries were not numerous, but the Judges considered every animal to be above ordinary merit, and the whole display creditable to the Principality. The heifer classes (110, 111) were the best represented as regards quality and style.

Red Polled.—This breed mustered 27 entries in five classes, the younger bulls (Class 113) being the most numerous, with seven entries. The bulls "showed improvement as far as length, but there were some which erred on the coarse side." The females were good classes, more particularly the cows.

Aberdeen Angus.—A good muster of 56 entries was spread over five classes, of which Class 121 was the largest, with 15 yearling heifers. Altogether they made an exceptionally good show, there being many animals of exceptional merit, especially in the class just mentioned.

Galloways.—Twenty-four entries were shown in five classes, the yearling heifers (Class 126) being the best represented, with 9 entries. The aged bull class attracted only one entry.

Ayrshires.—There were 19 entries in five classes, the largest being that for young bulls (Class 128), with 5 entries. In respect of quality, however, the two-year-old heifers (Class 130) proved the strongest class.

Jerseys.—A big display of 158 animals found accommodation in five classes, of which Class 135, two-year-old heifers, rendered the best account of itself with 41 entries. All the classes, however, were well filled and of excellent average merit. Yearling bulls (Class 133) made an attractive class, with many animals very even in points, thus rendering it difficult to place them. The cows in Class 134 were a capital lot; the prize animals, together with the dozen that received H.C., left little to be desired from a breed and dairy point of view. Class 135 was full of two-year-old heifers showing great

dairy promise. Though Class 137 contained many very worthy yearling heifers, "it had perhaps the weakest tail to it of any of the Jersey classes." The Judges add:—

It is not necessary to apologise for giving so many high commendations. The generally good character of the animals competing rendered it quite impossible to judge the classes otherwise. The way in which Jersey breeders have of late years bred for beauty of form and dairy properties combined does great credit both to themselves and to the breed.

Guernseys.—Five classes received 79 entries, the largest muster being the 20 cows in Class 139. From a numerical point of view the breed was unusually strongly represented, and although there was no individual animal of exceptional merit, the general quality of the exhibits was fairly well sustained. Class 138 furnished several promising young bulls. Class 139, though including eight cows which received notice, "did not contain a single animal without some defect or other." Two-year-old heifers (Class 140) formed, so far as quality goes, the weakest class in the section, "not a single animal being up to the usual standard." On the other hand, the yearling heifers were exceptionally good, and included several youngsters of great promise.

Kerries and Dexters.—Two classes were assigned to each section, the entries comprising 18 Kerries and 22 Dexters. Of Kerry bulls (Class 142), those mentioned in the prize list were the best four bulls the Judges had seen together. The six Kerry cows (Class 143) noticed were all of true type. Of the Dexter bulls (Class 144), the first two were far superior to the others, but the whole class was noteworthy for its uniform character. The Dexter females (Class 145) were decidedly the best class in this section. Speaking generally, the Judges observe:—

Kerries and Dexters, of which there were forty entries, were in our opinion the best collection we have yet seen at the Royal Show. Although strong in numbers there were but few bad specimens of the breed, and the prize-winners in each class were very good animals.

Dairy Cattle.—Considerable alterations were made in the Classes for Dairy Cattle as compared with last year at Manchester. Instead of there being three classes for single cows, judged by inspection only, and one class for pairs of cows similarly judged, the latter class only was retained. Further, in place of the two classes, one for milk production, and the other for butter yield, there were now three classes, but with certain modifications, introduced primarily with the object of securing that the competing animals should be of pure breed.

In place of a class for the largest yield of milk of good

quality, Class 146 was restricted to Shorthorns, Ayrshires, or pure breeds other than Jersey, Guernsey, Kerry and Dexter, and both yield and quality of milk were taken into account. Class 147 was confined to Jersey, Guernsey, Kerry and Dexter cows, to be judged for their butter-producing qualities; while a third Class (148) was thrown open to cows of any weight, breed, or cross, to be judged for the largest quantity of milk yielded, of good quality.

The three Classes, 146, 147, 148, accordingly had to be decided with the help of chemical analysis, the standard fixed for the quality of the milk being as in the previous year, viz.: "the milk to contain 12 per cent. of total solids, of which not less than 3 per cent. shall be fat."

The Consulting Chemist reports on these Classes as follows:—

In Class 146, for Shorthorn, Ayrshire, &c., cows, the yield and quality of the milk to be taken into consideration, there were 7 entries and 6 actual competitors, or one less than last year at Manchester. An interesting feature in this competition was the appearance of 3 cows of the Lincolnshire Red Shorthorn breed, together with the excellence of their yield. Two of these cows secured the first and second prizes in this Class, the first prize going to a 6½-year-old cow, which gave the satisfactory return of 59¼ lb. of milk in 24 hours (two milkings) and 31·4 oz. of butter-fat. Taking the average of the morning and evening's milk, the standard of quality was just reached. The second prize cow, also a Lincoln Red, but a cow 10½ years old, gave, in the two milkings, 58¼ lb. of milk, and the same weight (31·4 oz.) of butter-fat as the first-prize winner, the milk also being of the required quality. The third Lincoln Red cow gave still more milk than the foregoing, viz. 64¾ lb., but the milk was deficient as regards "total solids." Two other cows, No. 1474, a Red Polled, and No. 1475, a Shorthorn, gave, respectively, 56 lb. and 64¾ lb. of milk; but in each case there was deficiency in "total solids," these averaging 11·6 per cent. and 11·3 per cent. only.

There were originally 15 entries in Class 147, confined to Jersey, Guernsey, Kerry, and Dexter cows, to be judged for their butter-producing qualities. Of these, 11 competed, 10 being Jerseys and 1 Kerry. With one or two exceptions the yield of butter-fat was very satisfactory. The first prize went to a 6-year-old Jersey cow, *Clemency*, belonging to Earl Cadogan, which gave in the two milkings 32·8 oz. of butter-fat. Mrs. McIntosh's *Zenobia 34th* was second, with a yield of 31·7 oz. of butter-fat; and the third prize was secured by Mr. Calvert's *Babraham Belladonna*, a Kerry cow, which gave the highest yield of milk, viz. 50¼ lb., in this class, and 31·4 oz. butter-fat. The reserve number went to Mrs. McIntosh's *Zenobia 35th* with 31·2 oz. of butter-fat.

In Class 148, for cows of any weight, breed or cross, judged for the largest quantity of milk of good quality, there were 2 entries, but only one cow competed, viz., Mr. Raingill's Shorthorn and Ayrshire Cross, 6 years old. The yield and quality of the milk of this cow were, however, exceedingly good, 63¾ lb. of milk being given in the 24 hours, and this up to the required standard.

The cows were milked dry on the Sunday evening, June 19, at 5 P.M., and the milkings for the purpose of the competition were taken at 7 A.M. and 5 P.M. on the day following (Monday, June 20).

Awards for Dairy Cows in Classes 146, 147, & 148.

Class 146.—*Dairy Cow, in-milk, of the Shorthorn, Ayrshire, or other pure breed not named in Class 147, judged for the yield and quality of their milk combined, the milk to contain 12 per cent. of total solids, of which not less than 3 per cent. shall be fat.* 1st Prize, £15 ; 2nd, £10 ; 3rd, £5.

No. in Catalogue	Name of Exhibitor	Name of Cow	Breed of Cow	Age	Date of Calving in 1898	Yield of Milk: Mon. morn.	Yield of Milk: Mon. even.	Yield of Milk: Total	Quality of Milk: Mon. morn. Fat	Quality of Milk: Mon. morn. Solids	Quality of Milk: Mon. even. Fat	Quality of Milk: Mon. even. Solids	Total Weight of Butter-fat	Awards and Remarks
				yrs.		lb.	lb.	lb.	per cent.	per cent.	per cent.	per cent.	oz.	
1470	John Evens	*Old Profit*	Lincoln Red	10½	March 27	35¼	23	58¼	3·0	11·62	3·95	12·53	31·4	2nd prize.
1471	do.	*Ruby*	do.	8½	March 4	37¼	27	64¼	2·5	11·07	3·65	11·90	—	deficient in solids
1472	do.	*White Foot*	do.	6½	April 25	31¼	27¾	59	2·25	11·10	4·55	13·11	31·4	1st prize.
1473	Mrs. Frances Pratt	*Mayflower*	Shorthorn	6	May 20	18¼	13	31¼	3·5	13·15	4·1	13·52	19·1	3rd prize.
1474	Lord Rothschild	*Flora 4th*	Red Polled	8	April 30	30½	25½	56	2·55	10·80	4·85	12·62	—	deficient in solids
1475	do.	*Wild Queen 2nd*	Shorthorn	9½	March 10	39¼	25½	64¾	2·45	10·34	4·4	12·75	—	do.

Class 147. *Dairy Cow, in-milk, of the Jersey, Guernsey, Kerry, or Dexter breeds, judged for their butter-producing qualities.* 1st Prize, £15 ; 2nd, £10 ; 3rd, £5.

No. in Catalogue	Name of Exhibitor	Name of Cow	Breed of Cow	Age	Date of Calving in 1898	Yield of Milk: Mon. morn.	Yield of Milk: Mon. even.	Yield of Milk: Total	Butter-fat in the Milk: Mon. morn.	Butter-fat in the Milk: Mon. even.	Weight of Butter-fat: Mon. morn.	Weight of Butter-fat: Mon. even.	Weight of Butter-fat: Total	Awards and Remarks
				yrs.		lb.	lb.	lb.	per cent.	per cent.	oz.	oz.	oz.	
1477	Earl Cadogan, K.G.	*Clemency*	Jersey	6	May 10	22½	16	38½	4·7	6·2	16·9	15·9	32·8	1st prize.
1478	John H. Calvert	*Babraham Belladonna*	Kerry	6	April 13	30½	20¼	50¾	3·85	3·9	18·8	12·6	31·4	3rd prize.
1479	Edward Carter	*Frill*	Jersey	7½	May 24	19	15¼	34¼	3·9	6·65	11·9	16·5	28·4	
1480	do.	*Latakia*	do.	5	March 8	14½	9¼	23¾	4·6	7·0	10·7	10·4	21·1	
1484	Mrs. C. McIntosh	*Zenobia 34th*	do.	6¾	April 18	24	17¼	41¼	4·1	5·65	15·7	16·0	31·7	2nd prize.
1485	do.	*Zenobia 35th*	do.	6¼	May 18	23	16¼	39¼	4·3	5·75	15·8	15·4	31·2	Reserve number & [H. C.
1486	The Maisonnette Dairy Co.	*One More*	do.	7½	April 4	17	11	28	3·35	3·4	9·1	6·0	15·1	
1488	G. Murray Smith	*Daffodil*	do.	5½	April 28	24	16½	40½	3·8	5·05	14·6	13·3	27·9	
1489	Dr. Herbert Watney	*Vesta 2nd*	do.	13	April 22	20¼	14½	34¾	4·5	5·35	14·6	12·4	27·0	
1490	do.	*Queen Bess of Ruthven*	do.	5½	March 12	24¼	18	42¼	4·0	4·75	15·8	13·7	29·5	
1491	do.	*Siphon*	do.	6½	April 29	19¾	16¾	36½	4·2	5·95	13·3	15·9	29·2	

Class 148.—*Dairy Cow, in-milk, of any weight, breed, or cross, giving the largest quantity of milk, containing 12 per cent. total solids, of which not less than 3 per cent. shall be fat.* 1st Prize, £15 ; 2nd, £10 ; 3rd, £5.

No. in Catalogue	Name of Exhibitor	Name of Cow	Breed of Cow	Age	Date of Calving in 1898	Yield of Milk: Mon. morn.	Yield of Milk: Mon. even.	Yield of Milk: Total	Quality of Milk: Mon. morn. Fat	Quality of Milk: Mon. morn. Solids	Quality of Milk: Mon. even. Fat	Quality of Milk: Mon. even. Solids	Awards and Remarks
				yrs.		lb.	lb.	lb.	per cent.	per cent.	per cent.	per cent.	
1493	Samuel S. Raingill	—	Shorthorn & Ayrshire Cross	6	June 4	37¼	26½	63¾	3·0	11·9	3·45	12·4	1st prize

(Signed) J. Augustus Voelcker, *Consulting Chemist.*

In Class 149, judged by inspection, there was no restriction as to breed, the class being provided for "pair of dairy cows, in milk, of any breed or cross." The Judges report:—

In a class with only five animals we had no difficulty in determining the first and second prizes, being cows very full of quality, the first prize having exceptionally good udders. The Reserve Numbers had good shaped udders, but we did not consider them of sufficient merit to recommend the Stewards to award a third prize. In each of the other two entries we found one cow having a weak quarter.

SHEEP.

As was to be expected, in virtue of the locality, the breeders of Shropshire sheep rose to the occasion, and not only provided by far the largest representation of any one breed, but beat their own records for the four preceding years. Southdowns rank next with a very creditable total, the largest since 1894. From the table below it is seen that Lincolns, Hampshire Downs, Oxford Downs, Cotswolds, and Kentish all mustered well in comparison with recent years. A feature of the competition was the provision of classes for pens of ten Shropshire ewes (Class 176), of five Shropshire shearling rams (Class 173), and of five Lincoln shearling rams (Class 162).

Entries of Sheep at the last Five Country Meetings, 1894–98.

—	Birmingham, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895	Cambridge, 1894
PRIZES OFFERED	£1,275	£1,275	£1,291	£1,170	£1,215
Sheep	No. of Pens	No. of Pens	No. of Pens	No. of Pens	No. of Pens
Leicesters . . .	35	60	42	44	23
Cotswolds . . .	32	21	20	12	24
Lincolns . . .	75	73	50	27	37
Oxford Downs . .	41	27	28	25	38
Shropshires . . .	147	141	127	93	120
Southdowns . . .	84	74	64	50	109
Hampshire Downs .	59	58	60	38	52
Suffolks . . .	13	18	23	23	71
Border Leicesters . .	36	61	42	47	17
Somerset and Dorset Horned . .	6	10	7	8	17
Kentish or Romney Marsh . .	27	19	23	15	15
Wensleydales . .	18	21	14	47	24
Cheviots . . .	8	8	7	12	9
Black-Faced Mountain.	12	19	12	28	8
Lonks	6	7	4	8	5
Herdwicks . . .	6	15	10	14	10
Welsh Mountain . .	16	17	18	14	9
Total Entries of Sheep	624	649	551	505	588

Leicesters.—Thirty-five pens represented six separate flocks. Rams (Class 150) were of great merit, and shearling rams (Class 151) were very good, the first and second prize sheep being of true Leicester type. Classes 152 and 154 were not up to the mark in either numbers or quality, but in Class 153, shearling ewes, there was keen competition, some very good animals coming forward.

Cotswolds.—Thirty-two pens were entered from six distinct flocks, and the Judges regarded them as highly creditable to the exhibitors. The prize rams (Class 155) showed very masculine character, and the shearling rams (Class 156) were stronger than have been seen at the Royal Show for some years. Both classes of lambs were well forward, whilst shearling ewes (Class 158) made a very good lot.

Lincolns.—Seventy-five pens were entered by sixteen different breeders. The following is the Judges' report:—

The Lincoln sheep we consider exceptionally good. A large class of shearling rams are particularly so; they are well grown, showing plenty of quality and size. The rest of the exhibits are very characteristic of the breed.

Oxford Downs.—Twelve breeders contributed in all 44 pens. The rams (Class 166) were a good class of old sheep. Shearling rams (Class 167), though strong in numbers, "included no exhibit calling for special notice." The ram lambs (Class 168) were a useful lot. The shearling ewes (Class 169) made up the strongest and best class. Amongst the ewe lambs (Class 170) the first and second prize pens were fair representatives of the breed.

Shropshires.—As many as 27 breeders contributed to the great display of 147 pens. With regard to the male classes the Judges considered it, upon the whole, one of the best exhibitions of rams they had seen for some years, showing great uniformity of type throughout. The two-shear rams (Class 171) were the weakest lot that came under notice, as excepting the first and second prize animals "there was nothing of any particular merit." Shearling rams (Class 172) were fairly good, the first prize going to one of the best rams seen for several years. The pens of five shearling rams (Class 173) made by far the best class; the prize pens contained sheep of great individual merit, which would have shown creditably in the single ram class. The ram lambs (Class 174) proved a difficult class to judge; the winning pens included several lambs of great promise.

Turning to the female classes, the shearling ewes (Class 175) showed great merit; some of the pens, however, contained

two very good ewes, but the third was inferior and did not match. The prize pens were of good form, and showed the true characteristics of the breed. Class 176, for pens of ten ewes, was perhaps the best; the whole of them were good Shropshires, the prize pens especially so. Amongst the ewe lambs (Class 177) there was considerable difference in the size of the animals in the different pens, but the prize pens bore inspection well.

Southdowns.—The 84 entries represented 16 separate flocks. The Judges say:—

Ewe class good, and ewe lamb and ram lamb classes also good. In the old ram class the first prize sheep was very good, but there were several indifferent sheep. The shearling rams included some good sheep, but many were very indifferent and lacking in quality.

Hampshire Downs.—The 59 pens were entered from 18 separate flocks, and the breed as a whole was well represented. The shearling rams (Class 184) were not of so even a quality as the two-shears (Class 183), although the prize animals well deserved their honours. The ram lambs (Class 185) were remarkably good. The ewe lambs (Class 187) included so many capital pens as to cause the Judges considerable difficulty, the whole of the exhibits being of unusual excellence.

Suffolks.—Thirteen pens were drawn from four flocks. Subjoined is the report of the Judges:—

We have to regret the very small entry of this popular breed, owing in part to the withdrawal of all entries made by the veteran breeder Mr. Joseph Smith, but we venture to hope that next year may bring fresh exhibitors, knowing as we do that there are many breeders possessing animals at the present time that would have done credit to their breed at a Royal Show. In the class for two-shear rams only two were exhibited, both of which we consider useful sheep, while in the shearling class, out of the four animals shown, two were of splendid type and quite first-class. Ram lambs brought three entries, all of which were of the right sort, the pen which was reserved containing an exceptionally good lamb, although his companions did not match him quite well enough to bring the pen nearer winning. The shearling ewes to which we awarded first prize we thought exceptionally good, while their competitors were somewhat wanting in female character. An unfortunate occurrence in the death of one of the ewe lambs belonging to the Earl of Ellesmere left only one pen, to which we awarded first prize.

Border Leicesters.—Thirty-six pens were entered from eight flocks. About half of the two-shear rams (Class 193) were of more than average quality, but in several cases the wool was not exactly of the type expected to be found on this breed of sheep. The shearling rams (Class 194) were better representatives of the breed than the older class. The remaining classes were of good quality.

Somerset and Dorset Horned.—The six pens entered represented two flocks. They were all good, the first prize pen of ewes exceptionally so.

Kentish or Romney Marsh.—Twenty-seven entries represented nine flocks. The rams showed distinct quality, and the ewes were, with a few exceptions, probably one of the best collections ever exhibited.

Wensleydales.—Eighteen entries were contributed from seven flocks. The ram class was not considered to furnish a representative exhibit of the breed. In the ewe class the first and second prize pens were remarkably good, but the remainder were somewhat backward in size and condition.

Cheviots.—Eight pens were entered from two flocks. The ram class was not very representative of the best type of the breed. The shearling ewes were much better, and the first prize pen of ewes proved to be the best exhibit in this section.

Black-faced Mountain.—Twelve entries were made from seven flocks. Rams formed a strong class of considerable merit, comparing favourably with the exhibitions of recent years. Ewes also were well shown.

Lonks.—Six pens represented two flocks. The leading pens in each class were in every way models of the breed.

Herdwicks.—Here again six pens were entered, but in this case from three flocks. The leading pens were good, both in quality and in wool, with plenty of bone in the ewes.

Welsh Mountain.—Sixteen pens represented five flocks. Both rams and ewes were of good quality, and some difficulty was experienced in deciding between the different pens. The Judges add:—

> The yearling ewes exhibited in Class 213 were extraordinarily good as a class, but the first and second prize pens, as well as the reserve pen, were about the best specimens of the breed that we ever saw. They were a credit not only to the breeders, but to the Principality, where more attention has been paid of late years to the mountain sheep, a breed that is evidently most suitable to the hills of Wales, but at the same time capable of much improvement in quality and size, by careful attention to the selection of good rams, and proper treatment and good management of the different flocks.

Pigs.

The display of pigs was the largest that has been seen in the Royal Showyard for some years. The White breeds in particular registered an increase in numbers, whilst the Tamworths also were unusually strong, as is seen from the table on the next page. A special class (Class 233) was provided by the Local Committee for Tamworth breeding sow, suckling her litter of pigs.

Entries of Pigs at the last Five Country Meetings, 1894–98.

—	Birmingham, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895	Cambridge, 1894
PRIZES OFFERED	£389	£462	£432	£432	£432
	No.	No.	No.	No.	No.
White	101	86	62	—	—
Berkshire . . .	53	59	55	—	—
Black	—	10	3	—	—
Tamworth . . .	44	30	24	—	-
Total Entries of Pigs .	198	185	144	—	—

Large White.—The entry comprised 54 pens. Class 215, for three young boar pigs, was a very good one. The first and second prize pens were remarkably well grown, heavy-fleshed pigs, all of one litter; they were straight on their legs, full of hair and quality, and did great credit to their breeder. Class 216, breeding sows, was a very strong one, and included a number of extraordinarily good sows. One or two were slightly deficient in the udder, but taken as a whole this was the best class of Large White sows that the Judges had seen for some years. There was a noteworthy improvement as regards the breeding condition in which most of the animals were shown. The Judges add:—

We were pleased to notice a marked improvement in the type of Large White pigs exhibited. The Middle White cross-bred character which was so prevalent a few years back has been to a great extent eliminated, and with very few exceptions there was a uniformity in the type of animals shown which was very gratifying.

Middle White.—Thirty-one pens were entered. The sows (Class 220) were not so good as have been seen in former years, and one or two of the animals were rather coarse.

Small White.—This section attracted an entry of 16 pens, and competition was keener than usual, except for the boar pigs (Class 223). The prize sows in Class 224 were particularly good, but sow pigs (Class 225) were rather inferior. Nevertheless, the Small Whites are, in the opinion of the Judges, decidedly looking up.

Berkshires.—The boars (Class 226) were fair representatives of the breed. Boar pigs (Class 227) were a weak class and, except the first prize pen, of very moderate quality. Sows (Class 228) were a strong class, but the first prize animal was an outstanding winner. The gilts (Class 229) were much superior to the boar pigs (Class 227), and the first prize pen was far ahead of the others.

Tamworths.—The boars (Class 230) were good, the prizes going to animals of true type. Boar pigs (Class 231) were not so satisfactory, the pens not being well matched. Class 232 was very good, save that some of the sows had lost colour. The sow pigs (Class 234) made a very even class, much better matched than the boar pigs in Class 231.

Poultry, including Ducks, Geese, and Turkeys.

The aggregate entry of 964 established a record for this section. The increase, as will be seen from the accompanying table, was chiefly due to the larger number of fowls, which by themselves contributed 758 entries.

Entries of Poultry at the last Five Country Meetings, 1894-98.

—	Birmingh'm, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895	Cambridge, 1894
PRIZES OFFERED	£257	£257	£245	£234	£212
	No.	No.	No.	No.	No.
Fowls	758	691	701	619	538
Ducks	84	84	80	63	65
Geese and Turkeys .	55	42	42	27	46
Table Poultry . .	67	50	78	60	56
Total Entries of Poultry	964	867	901	769	705

The entries at Birmingham included the following totals:—

Dorking . .	85	Plymouth Rock .	66	Any other recognised breed .	40
Game . .	122	Wyandotte .	118	Table Poultry (pairs) . .	47
French (any variety) . .	19	Minorca . .	56	Table Ducklings (pairs) . .	20
Brahma and Cochin . .	54	Leghorn . .	53		
Langshan . .	39	Orpington . .	75		
		Andalusian . .	23		
		Hamburgh . .	8		

Poultry.—The *Dorkings* were a grand collection for the time of year, and were excellent in plumage and condition, all the winners being large, deep-chested, square birds, standing on short white legs, and making ideal farmers' fowls. Many of the chickens were well grown, and promised to develop into fine birds. *Old English Game* were of very good quality throughout, and a considerable improvement on former years. Of *Indian Game* the quality, especially of the pullets, left little to be desired. The *French* classes were very poor in both numbers and quality, particularly the chickens. *Brahmas* and *Cochins* were excellent in the older classes, but the chickens were only moderate. *Langshans* provided two splendid classes of old birds and also a few grand chickens, but the entries were

small. *Plymouth Rocks* were excellent in all four classes. Of *Wyandottes* the silver classes were all that could be desired, whilst the gold or white classes were very good. *Minorcas*, both old and young, were a grand lot. *Leghorns*, though small in numbers, were excellent in quality. *Orpingtons*, again, were excellent throughout, and the chicken classes the best in the show. *Andalusians* were very good, some fine specimens winning in the cock class. *Hamburghs* were only moderate.

Ducks.—The entries were made up of 29 Aylesbury, 17 Rouen, 15 Pekin, 12 Cayuga, and 11 of Any Breed (except Aylesbury), and there were 20 pairs of table ducklings. The first and second prize birds in the *Aylesbury* classes, both ducks and drakes, were of exceptional merit, and the duckling classes were excellent. *Cayugas* made a very fine show, being of good size and full of lustre.

Geese.—These were few in number (15 entries), and were mostly in bad feather, being deep in moult. The four *Toulouse* ganders and the first and second prize *Embdens* were, however, very massive, typical birds.

Turkeys.—Forty pens were entered, and included many splendid birds, of great size and bone, and in grand plumage for the time of year.

Table Poultry.—The following is the report of the Judge in this section:—

The show of Table Poultry was much larger than at Manchester last year, the entries comprising 47 couple of chickens and 20 couple of ducklings. The quality was, on the whole, fairly good, more especially in the chickens. The ducklings hardly reached the average of recent years, because the majority were rather too far advanced, and consequently were full of pen feathers. As usual, the birds were shown alive on the first day, in the afternoon of which they were killed, and subsequently displayed in refrigerators. By my instructions the ducklings full of pen feathers were not stripped of these, thereby impressing the necessity of sending the birds at the proper age—a most important point.

Class 319.—Pair of cockerels of any pure breed. Nine entries, one absent. The winners were an excellent pair of Indian Game, very good in plumage, and very even in flesh, though, of course, yellow. Second, buff Wyandottes, one better than the other in colour of plumage; when dead, though both were remarkably fleshy, one was rather rough in skin, and a little dented on the breast bone. Third, the modern type of Langshan, long in leg, but even in flesh, and good in colour for this breed, but losing by roughness of skin. The reserve went to Plymouth Rocks. No pure Dorkings were shown in this class, which is somewhat remarkable. The highest and lowest dead weights per bird—not per couple—in this class were 6 lb. 0¾ oz., and 4 lb. 1¼ oz.

Class 320.—Pair of pullets of any pure breed. Eight entries. A nice class, which included some very good Dorkings, and one lot of Sussex. The first prize pair were large and forward dark Dorkings, well fed and uniform, and of excellent colour of flesh. Second, rather small Indian

Game, but exceedingly good in colour of flesh and skin, and in perfect condition. Third, nice plump Langshans, with delicate skin, and fleshy. Reserve, dark Dorkings. The extreme weights per dead bird in this class were 6 lb. 3¾ oz., and 2 lb. 13¼ oz.

Class 321.—Indian Game and Dorking cross-bred cockerels. Ten entries, one absent. First, very short in leg and gamey in appearance; rough in skin, when dead, but beautifully fleshy and exceedingly good in colour. Second, big birds, a little dark in flesh; would have been improved by more feeding. Third, somewhat uneven; one very good and in fine order, the other rough and not quite straight in the keel. Extreme weights per dead bird, 6 lb. 5¼ oz. and 3 lb. 9¾ oz.

Class 322.—Indian Game and Dorking cross-bred pullets. Seven entries. First, fine in bone, white-legged, of excellent colour, and very plump; second, long-bodied and nice-legged, but killed rough and not very plump. Third, small, but even in flesh and good in colour. Extreme weights per dead bird, 5 lb. 5 oz. and 2 lb. 10¾ oz.

Class 323.—Cross-bred cockerels, Indian Game and Dorking excepted. Seven entries. First, Dorking and Plymouth Rocks, with pinkish legs; the best in the class for flesh qualities, though one was slightly dented in the keel. Second, Buff Orpington and Dorking, of nice quality, and the legs of good white colour; this cross promises well. Third, Indian Game and Sussex, white-legged, and good in flesh, but a little heavy in bone and somewhat coarse of skin. Extreme weights per dead bird, 5 lb. 8¼ oz. and 2 lb. 11¾ oz.

Class 324.—Cross-bred pullets, Indian Game and Dorking excepted. Six entries. First, Dorking and Plymouth Rock again; the birds showed Rock plumage, and were slightly feathered on the legs, which were, however, white, of good quality, and delicate in skin. Second, Brahma and Dorking, of delicate skin and nice colour. Third, Buff Orpington and Dorking, delicate and good in flesh, and confirming what is said as to this cross in Class 323. Reserve, Indian Game and Buff Orpington, another excellent cross, delicate in flesh and skin. Extreme weights per dead bird, 3 lb. 15¼ oz., and 2 lb. 8¾ oz.

Class 325.—Pure-bred ducklings. Fourteen entries, two absent. All the winning pairs were pure Aylesbury. First prize pair looked rough when alive, but killed very well, and were clean, beautifully fleshed, and in first-class condition. Second, good in size, but rather stubby, and would have been beaten by the third prize pair had the latter been even. Extreme weights per dead bird, 6 lb. 9¼ oz., and 4 lb. 0¼ oz.

Class 326.—Cross-bred ducklings. Six entries. First, Aylesbury and Pekin, the best pair of ducklings in the show, of lovely colour, and in first-class order. Second, same cross; larger, but hard in flesh and seemed to be older. Third, Pekin and Aylesbury; even and of good colour, but rather small. Extreme weights per dead bird, 5 lb. 12¼ oz., and 4 lb. 3¾ oz.

DAIRY PRODUCE.

The entries of Butter, as shown in the table on the next page, were much above the average of recent years, whilst those of Cheese registered a somewhat considerable decline.

Butter.—Four classes were provided: Class 327, for kegs of butter delivered on May 7 (27 entries); Class 328, for boxes of twelve 2-lb. rolls, made with not more than 1 per cent. of salt (14 entries); Class 329, for fresh butter, slightly salted (107

Entries of Produce at the last Five Country Meetings, 1894–98.

	Birmingham, 1898	Manchester, 1897	Leicester, 1896	Darlington, 1895	Cambridge, 1894
PRIZES OFFERED	£252	£406	£300	£286	£265
	No.	No.	No.	No.	No.
Butter	225	187	141	145	162
Cheese	120	195	153	130	72
Cider and Perry	112	89	95	30	74
Jams, &c.	—	—	—	5	10
Hives and Honey	178	244	185	166	220
Total Entries of Produce	635	715	574	476	538

entries); Class 330, for fresh butter, slightly salted, made from milk from cows other than Channel Islands or cows crossed with Channel Islands breeds (77 entries). In Class 327 the general quality was excellent, nearly all the butters being in good condition, and with commendable colour and flavour. The first prize keg was particularly fine. As to the other classes the Judges, who on this occasion were ladies, report as follows:—

Speaking of the butter generally, the average quality was not so good as should be seen at a show like the Royal, which is open to the United Kingdom.

The entries in Classes 329 and 330 were very numerous, and some of the butter was excellent, but the cream in many instances had been overkept. One first prize was withheld, as only three samples were considered worthy of first prizes. The appearance in many cases would have been improved had exhibitors taken more care in the packing.

No first prize was awarded in Class 328, owing to the inferiority of the quality, appearance, and packing. The exhibitors seemed to have misunderstood the regulation which stated that the butter was to be made into rolls.

Cheese.—The six classes were all for cheese of this year's make. Of *Cheddar* there were 18 entries, and, taken as a whole, the quality and make were fairly good; the first and second prize lots stood out very boldly from the others. Of *Cheshire* (23 entries), some were very new and soft, and others untrue in colour. Of *Stilton* (18 entries) a large number of the cheeses were very young, and some were deficient in quality. Cheese of *Any other British make* (37 entries) included many different kinds, the four prize lots being two Leicesters, one Somerset Thick, and one Truckle. *Cream* cheese, made *with* the use of rennet (9 entries), was a poor class, as some had been kept too long and was completely off flavour; but the prize lots were very good. *Cream* cheese, made *without* the use of rennet (15 entries), was as a rule of good quality. There was, however, some variation even in the prize lots, which included both sweet and sour varieties.

Cider and Perry.

The 112 entries in this section were very considerably above the average number. Class 337, for cider in cask, attracted 26 entries; Class 338, for bottled cider made in 1897, 41 entries; Class 339, for bottled cider made before 1897, 21 entries; and Class 340, for bottled perry, 21 entries. Arrangements were effected to enable visitors to sample these exhibits, and at certain specified hours the Steward of Produce was present for this purpose. Subjoined is the report of the Judges:—

Class 337.—The three first prizes are good sound cider, but not up to the vintage of some years, and the class as a whole is not a superior one, many of the exhibits being very poor in quality.

Class 338.—This is a very strong class indeed, the quality as a whole being much superior to the Class 337 in cask, although a few exhibits were thin and poor in quality; the first prize was of very fruity flavour, and with age will develop into a very fine cider.

Class 339.—A good class, containing several superior samples; the first prize in this class was the best cider exhibited for competition.

Class 340.—Taken as a whole this was a very good class; the first prize of old vintage and of very superior quality.

Hives, Honey, &c.

Twenty-one classes were provided in this department, and attracted 178 entries, the total being somewhat below the average of recent years. The Judges report as follows:—

The exhibits displayed in the bee department this year afford evidence of good progress, but owing to the cold and inclement weather for some weeks prior to the Show the current season's honey staged was below the average of recent years.

The improvements in the bee goods staged in the appliance classes, however, show a considerable advance, and the manufacturers of hives are beginning to realise the need for meeting a long-felt want of bee-keepers in this country, by devising hives for facilitating the prevention of swarming. In Class 344 most of the hives had arrangements of this sort, and prizes were awarded to those considered by the Judges as most likely to effect the desired end.

Class 342 was a new departure, the prizes being offered for the "most suitable outfit for a beginner in bee-keeping, price not to exceed 30*s*." There were eight entries, and a keen competition resulted.

In Class 358, for "Useful inventions connected with bee-keeping," prizes were awarded for improvements in section racks and methods of fixing foundation. The Judges would specially refer to a double hive not noticed by them in this class, the construction of which was of such a complicated nature as to be utterly useless for the practical bee-keeper. They desire to emphasise the fact that the main point to aim at in improving a hive is simplicity of construction.

In Class 361, for "Instructive and Interesting Exhibits connected with Bee Culture," the most important exhibit staged was a "Solar" wax-extractor and a case of samples, illustrative of its uses, which accompanied it. The

first prize was awarded to this interesting exhibit. The samples very clearly showed how clean wax could be obtained from either old combs or refuse wax by means of the sun's rays. There was also included a jar of honey melted down in the "Solar" from unsaleable granulated sections. The honey had apparently lost none of its original flavour, whilst the wax removed from it during the melting process was of excellent quality.

Considering that this Show is usually held too early in the year for the main honey crop to be available in competition, it was very creditable to those exhibitors who staged the current season's produce, in the face of difficulties altogether beyond their control.

Horse-shoeing Competitions.

These competitions, conducted at the Shoeing Forge, were open to shoeing-smiths in any part of the United Kingdom, Class I. being for Hunters, and Class II. for Dray Horses. The Judges say:—

Class I.—We have examined the competitors in this class, in which there were thirty-eight entries. One man who brought no proper tools retired from the contest, and two other men were disqualified for not arriving on the ground in proper time. The work was very well done as a whole; the men whom we examined orally seemed to understand the anatomy of the foot, and the feet were properly treated during the competition.

Class II.—In this class there were thirty-five entries and thirty-two competitors; three were absent, one owing to illness, and two who were very late in arriving and were consequently disqualified. The work done was again very good, and the answers to our questions in the oral examinations were even better than in Class I.

On the Wednesday morning Mr. J. M. Parker, M.R.C.V.S., one of the Judges, gave at the Shoeing Forge a lecture on "The Horse's Foot, and How to Shoe it." The address was listened to by an attentive audience.

Conclusion.

From an agricultural point of view the Meeting of 1898 has well justified its claim to rank amongst the best of the Society's annual gatherings. In nearly every department of the Show a high standard of excellence was maintained, whilst in several sections the signs of progress were plainly visible. The fact that the financial result was of an adverse character should not be allowed to detract from the intrinsic merits of the display. The great matter for regret is that at least twice as many visitors did not succeed in reaching the ground, and seeing for themselves the admirable exposition of British Agriculture which throughout the Midsummer week occupied Four Oaks Park.

W. Fream.

13 Hanover Square, W.

THE TRIALS OF SELF-MOVING VEHICLES AT BIRMINGHAM.

Four prizes for Self-moving Vehicles, which were originally offered by the Society in connection with the Manchester Meeting of 1897, were again thrown open to general competition at the Birmingham Meeting of 1898. Mr. F. S. Courtney, the Society's Consulting Engineer, has contributed his notes on the 1897 competition, and these are appended to this Report (see p. 488). It was arranged that the competition should be in two classes. Class I., in which 1st and 2nd prizes of 100*l.* and 50*l.* respectively were offered, comprised such vehicles as would take the place of light spring carts for carrying loads up to one ton, exclusive of the weight of the vehicle. Class II., in which also 1st and 2nd prizes of 100*l.* and 50*l.* were offered, included vehicles capable of carrying three tons, exclusive of the weight of the vehicle. Practically no restriction was placed on the kind of mechanical motive power or the fuel to be used. In the case of oil-engines the oil was to be such as is allowed by the "Regulations as to Petroleum," made by the Home Secretary in accordance with Section V. of the "Locomotives on Highways Act, 1896." The design of engine and vehicle was left entirely to the manufacturers, only subject to compliance with the regulations issued by the Local Government Board under Section VI. of the "Locomotives on Highways Act, 1896." The competition was, however, limited to vehicles carrying their loads, and not drawing them.

It was prescribed by the Society that trials should be made of the competing vehicles, carrying an ordinary load, over a distance of not less than fifty miles, or such further distance as might be deemed desirable. Other trials were to be made, if necessary, to test the efficiency of the vehicles when ascending or descending steep gradients.

To carry out these trials the Society appointed as Judges Mr. F. W. Webb, M.Inst.C.E., of Crewe; Mr. Bryan Donkin, M.Inst.C.E., of Southwark Park Road, London, S.E.; and the writer of this Report. Mr. Courtney, as Consulting Engineer, made all the necessary arrangements, which were in every respect satisfactory. He selected a road for the trials of the desired length, and with some sufficiently severe gradients, and took the necessary distances and levels. He also provided a staff of assistants, one of whom was placed on each car during each run, and was charged with the duty of noting particulars of the fuel and water used, the speed, and the

incidents of the run. To these assistants, Mr. J. E. Compton-Bracebridge, Mr. C. A. Mills, and Mr. J. B. Belcher, the thanks of the Judges are further due.

The Self-moving Vehicles entered for Competition.

In the competition in 1897 only one vehicle was presented which professed to be able to comply with the conditions prescribed. This year there were nine entries, and of these five appeared and prepared to undergo the trials. It will be stated shortly that two of these were almost immediately disabled, so that only three competitors—one in the light class and two in the heavy class—completed the runs satisfactorily. This is a considerable advance on the state of things in the previous year; but it indicates that the problem of building motor vehicles, capable of carrying substantial loads for considerable distances, has presented difficulties which most makers have not entirely overcome. The competitors, even this year, were hardly so well prepared for the contest as might have been expected, considering the very great commercial value of a success in such a competition.

The following is a list of the competing vehicles, with their numbers in the Implement Catalogue of the Birmingham Meeting:—

Class I.—Self-moving Vehicles for Light Loads.

Article 4930. *The Daimler Motor Co.*, Shaftesbury Avenue, London. A 4 nominal H.P. Daimler motor van. Motor with two vertical cylinders. Gearing for four speeds, viz.: 2, 4, 6 and 8 miles an hour. Reversing gear, direct steering, and two brakes. Fuel, benzine or petrol or petroleum spirit. Weight, unladen, 19½ cwt. Price 350*l.*

Article 4931. *Messrs. Roots & Venables,* Westminster. A covered van propelled by a 6 B.H.P. oil motor using paraffin or kerosine oil having a flash-point of 73° or upwards. Patent transmission gear with two speeds and clutches. Reversing gear. Motor with two cylinders, 5 in. diameter and 7-in. stroke. Oil carried in 3-gallon tank, and tank with 19 gallons of cooling water. Weight about 1 ton. Price 370*l.*

Article 4932. *The Lancashire Steam Motor Co.,* Leyland, Preston. Van to carry 1 ton. Price 285*l.*

Article 4933. *Mr. H. P. Saunderson,* Kempston Road, Bedford. A vehicle propelled by a simple, single cylinder oil engine using benzine or petrol. Cylinder, 6½ in. diameter, 10-in. stroke. Power transmitted by belt to cross shaft. Two driving speeds by spur wheels and clutches. Wood road wheels with iron tyres. Weight about 1 ton. Price 250*l.*

Class II.—Self-moving Vehicles for Heavy Loads.

Article 4934. *Messrs. Coulthard & Co.,* Preston. A steam motor driven lorry. The steam is raised in a patent liquid fuel, water-tube boiler,

the working pressure being 200 lb. per sq. in. Engine, compound vertical, making 450 revs. per minute. Two speed gear, for $2\frac{1}{4}$ and 5 miles per hour. Weight about 2 tons 18 cwt. Price 350*l.*

Article 4935. *Messrs. Jesse Ellis & Co.*, Invicta Works, Maidstone, Kent. A vehicle driven by steam. Weight about 3 tons. Price about 550*l.*

Article 4936. *The Lancashire Steam Motor Co.*, Leyland, Preston. Waggon to carry 3 tons. Compound steam engine. Oil fired boiler, with vertical tubes, working at 200 lb. per sq. in. pressure. Screw and band brakes. Gear for three forward speeds. Reversing gear. Fuel, ordinary Russian petroleum oil, obtainable at $4\frac{3}{4}d.$ per gallon. Weight, 2 tons 10 cwt. Price 375*l.*

Article 4937. *Messrs. Mann & Charlesworth*, Canning Works, Leeds. Tipping waggon driven by steam. Price 330*l.*

Article 4938. *The Steam Carriage and Waggon Co.*, Homefield, Chiswick. Vehicle propelled by compound reversing steam engine, supplied with steam by a "Thornycroft" water-tube boiler working at 175 lb. per sq. in. pressure, and using coal or coke. Wrought iron wheels and iron tyres. Helical gearing wheels for one speed only. Screw brake and reversing gear. Average working speed, 5 miles an hour. Weight, 3 tons. Price 650*l.*

On the morning of June 13 it was found that some of these vehicles had not arrived at the Show-yard, or had been withdrawn from competition. Three in the light class and two in the heavy class were presented for weighing and loading. But of these, two in the light class were almost at once disqualified from continuing the contest. Messrs. Roots & Venables had come unprovided with suitable oil for their motor, and they also stated that some injury had been done to their van on the railway. They elected, however, to start in the competition with no load. Shortly after leaving Bassett's Pole for the 13-mile run a private motor car collided with the Roots & Venables van. The hub of a front wheel was struck, the steering-handle was knocked out of the driver's hand, and the van turned into a ditch. After this Messrs. Roots & Venables retired from the competition, which they could hardly be said to have entered as they carried no load.

Mr. Saunderson started from the Showyard loaded properly, but before reaching Bassett's Pole a joint packing in the cylinder blew out. It was then determined by those in charge to withdraw from the competition.

Description of the Three Self-moving Vehicles which completed the Two Days' Running.

Three vehicles only—an oil-motor vehicle in the light load class and two steam-propelled vehicles in the heavy load class—

satisfactorily completed the prescribed two days' running, and of these the following is a more detailed description :—

The Daimler Motor Company, Shaftesbury Avenue, London.—The self-moving vehicle of this company (fig. 1), was a covered van, with panelled sides, movable canvas top, and tail-board to let down for loading.

The engine is a 4 nominal horse-power oil-engine, using light oil, benzine, or petrol. It has two vertical cylinders, 3⅝ in. diameter and 6¾ in. stroke, enclosed in a Russian iron casing in front of the driver. The front cylinder ends and a casing

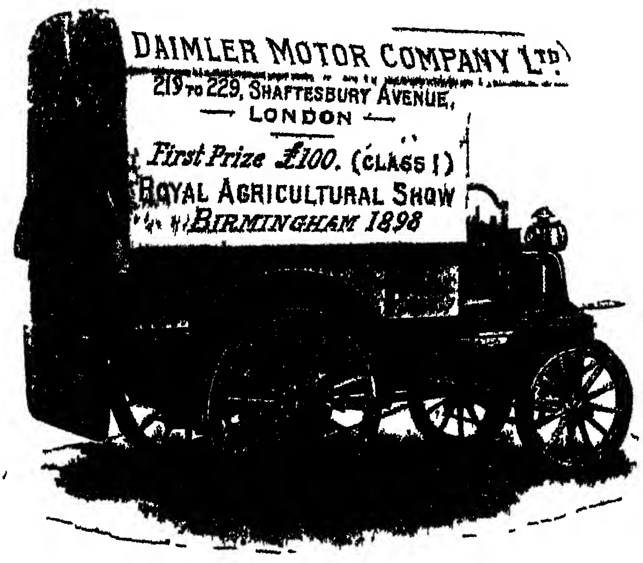


FIG 1.—The Daimler Motor Company's Van.

round the crank-shaft form a closed chamber, in which there is a bath of lubricating-oil which lubricates the crank-pins and pistons.

The engine drives by friction clutches (which slip at starting so that the vehicle is gradually put into motion) a square shaft, on which there are four spur driving-wheels giving normal driving speeds of 2, 4, 6 and 8 miles an hour. Change of speed is effected by sliding the wheels on the square shaft. A bevel pinion on this shaft gears with either of two bevel wheels for forward or backward motion of the car. A differential gear is fitted to the shaft between the two bevel wheels. From the

bevel-wheel shaft the road wheels are driven by sprocket wheels and pitch chains. The driving-wheels are 3 ft. 3 in. diameter, and the fore carriage wheels 2 ft. 6 in. diameter. The road wheels are tyred with $2\frac{1}{2}$ in. solid rubber tyres.

The vehicle has three brakes: a foot-brake acting on the countershaft; a brake on each of the sprocket wheels attached to the driving-wheels, operated by hand; and a shoe-brake on each driving-wheel, operated by a hand-lever. There is also a sprag, which can be lowered to prevent the vehicle running back on a hill. The brakes are so arranged that when applied they put the engine driving-clutch out of gear. When, therefore, the brakes are put on the engine runs idle.

The benzine or petrol is carried in a tank below the engine, from which it is raised to the engine by air pressure maintained when the car is running by the exhaust. The oil-tank is stated to contain 6 gallons, reckoned to be sufficient for 70 miles run. A cooling-water tank contains 16 gallons. The car was run without replenishing this tank on the long run on the second day of the trials. Normally, however, it is refilled with cold water from time to time when convenient. The oil used costs about $7\frac{1}{2}d.$ a gallon. It is not unimportant that there is an effective silencer for the exhaust.

The Lancashire Steam Motor Company, Leyland, Preston.—This company sent for the competition a lorry (fig. 2), with steel framing, carried on wood wheels with iron tyres five inches in width. Its open platform measured 75 sq. ft. It was driven by a compound steam engine, supplied with steam from a liquid-fuel fired steam boiler.

The boiler is a patent vertical multitubular boiler, with 110 sq. ft. of heating surface, and is worked at 200-lb. pressure per sq. in. It is stated to weigh 6 lb. per sq. ft. of heating surface, and steam is stated to be raised to working pressure in 18 minutes. For fuel during the trials ordinary Russian oil (lamp oil), costing $4\frac{3}{4}d.$ a gallon, was used. The supply of oil to the burner is regulated by the steam pressure, so that the steam pressure cannot rise above a fixed amount. The firing is, therefore, to a certain extent, automatically regulated. The car carried 46 gallons of water additional to that in the boiler. There is an air-condenser on the roof, in which a large part of the steam is condensed and returned to the feed-tank.

The engines are compound vertical engines of the enclosed marine type, giving 14 brake horse-power at 500 revs. per minute; cylinders, 3 in. and 5 in. diameter and 6 in. stroke. It was stated that the engine-bed was of aluminium and the gearing of aluminium-bronze.

The power is transmitted by clutches giving three forward speeds and one reverse speed. From the second motion shaft the power is transmitted to the differential gear by a pitch chain, and then to the road wheels by two Hans Renold pitch chains.

The car has two brakes, each capable of holding it on an incline of 1 in 7. One brake is a band-brake on the gearing-shaft actuated by a lever. The other is a shoe-brake on the road wheels actuated by a screw. The inside of the boiler can be lifted out for cleaning without removing any of the steam fittings.

The Steam Carriage and Waggon Company, Homefield, Chiswick.—The competitive vehicle of this company (fig. 3), was a

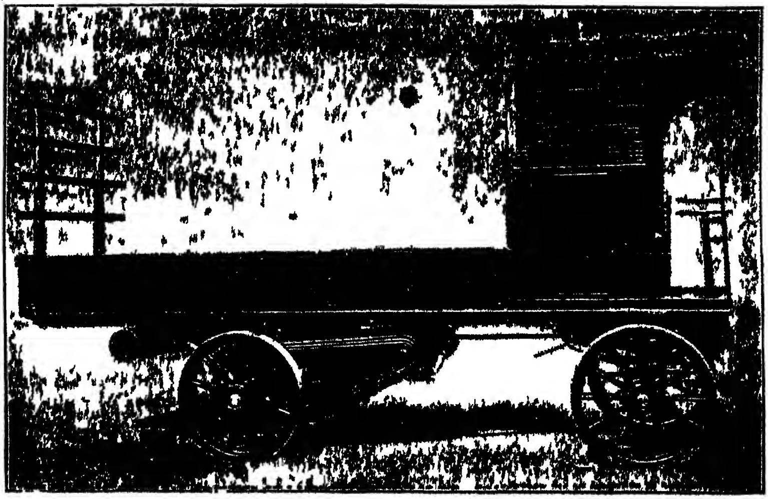


FIG. 2.—The Lancashire Steam Motor Company's Lorry

lorry having an enclosed cab in front containing the machinery. The main framing is of steel, which affords a more rigid foundation for the machinery than a timber frame. The road wheels are of steel, with roller-bearing hubs and iron tyres. The lorry has an available floor space for loading of 60 sq. ft. The vehicle is driven by a steam boiler and engine, and coal or coke is used for fuel.

The engine is a compound steam engine, with cylinders 4 in. and 7 in. diameter and 5 in. stroke, the cranks being at right angles. The engine is entirely enclosed in a strong casing, the working parts running in an oil-bath. It is stated that such an engine has run for two months without the casing

being opened. The casing has doors of aluminium to save weight.

The engine speed is first reduced by a pair of helical spur wheels with machine-cut teeth. Next, the power is transmitted, through a bevel-wheel differential gear, to countershafts which drive the road wheels by sprocket wheels and chains. The chains are the new form of Hans Renold chains of 1 in. pitch. The velocity ratio of engine and road wheels is 8 to 1. For reversing there is a scroll and shifting eccentric. There is no change of speed provided for in the gearing of this car, variation of speed being only obtained by variation of engine speed.

The boiler is a "Thornycroft" water-tube boiler, with vertical tubes, fired very conveniently from the top. The grate is cleaned by raising the fire-bars and letting the clinker fall through. For cleaning the tubes the top cover is removable; then all the tubes are accessible. The heating surface is 65 sq. ft., and the grate area $2\frac{1}{2}$ sq. ft. The boiler had been tested to 350 lb. per sq. in., and is worked normally at 175 lb. per sq. in. The fuel is steam coal or coke, and the fire is forced by a fan, worked by hand when lighting up, or by the engine when running. It is stated that steam is easily raised, starting with cold water, in 15 minutes. On the roof of the

General Dimensions of the Competing Vehicles.

——	The Daimler Motor Company, Article 4930	The Lancashire Motor Company, Article 4936	The Carriage and Waggon Company, Chiswick, Article 4938
Overall dimens. of vehicle	10 ft. × 5 ft.	$18\frac{1}{3}$ ft. × $6\frac{1}{4}$ ft.	16 ft. × $6\frac{1}{2}$ ft.
Inside dimensions of van .	$4\frac{1}{4}$ ft. × 5 ft.	$12\frac{1}{2}$ ft. × $5\frac{7}{8}$ ft.	$9\frac{1}{4}$ ft. × $6\frac{1}{2}$ ft.
Diameter of wheels, front .	2 ft. 6 in.	3 ft. $1\frac{3}{4}$ in.	2 ft. 9 in.
" " " back .	3 ft. 3 in.	3 ft. $1\frac{1}{4}$ in.	3 ft. 3 in.
Tyres . . . . in.	$2\frac{1}{2}$ solid rubber	4 and 5, iron	$4\frac{1}{2}$, iron
Length of wheel base in.	$69\frac{1}{2}$	121	87
Ratio of gearing between engine and road wheels	8·8, 12·6, 18, and 35 to 1	8, $13\frac{1}{2}$, and 28 to 1	8 to 1
Type of engine . .	2 cylinder vert. 4 H.-P.	compound vert. 14 B.H.-P.	compound vert.
Size of engine cylinders, in.	$3\frac{5}{8}$ × $6\frac{3}{8}$	3 and 5 × 6	4 and 7 × 5
Revs. of engine at full speed	700	500	500
Type of boiler	—	vert. tubular	water-tube
Heating surface of boiler .	—	110 sq. ft.	65 sq. ft.
Working pressure, lb. sq. in.	—	200	175
Water-tank capacity, galls.	15	46	50
Condenser	none	air surface	air surface
Fuel	benzoline	Russian petrm.	Newcastle coal
Capacity of oil tank, galls.	7	20	—
" of coal bunker, cwt.	—	—	2
Wgt. of vehicle empty, tons	1·162	2·86	3·00

car is an air-condenser of small copper tubes. This serves to silence the exhaust and the blow-off from the safety-valve, and returns about two-thirds of the steam used as water to the

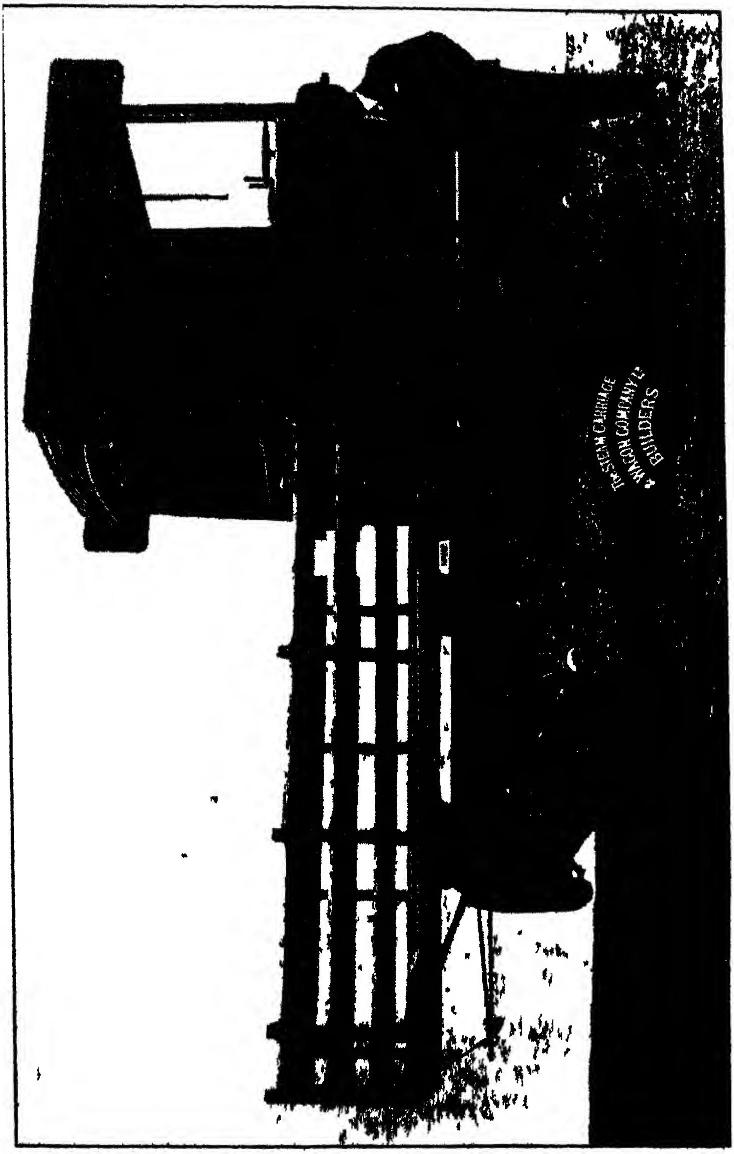


FIG 3.—The Steam Carriage and Waggon Company's Lorry.

feed-tank. There is an engine-driven feed-pump, and a small, separate steam feed-pump, also a powerful screw-brake acting on cast-iron shoes on the driving-wheels.

The general dimensions of all the vehicles are tabulated on p. 466.

The Trials of the Cars Running Loaded over a Thirteen and a Forty-six Mile Course.

The trials commenced on Monday, June 13, and runs were made with the loaded cars over a course $13\frac{1}{4}$ miles in length.

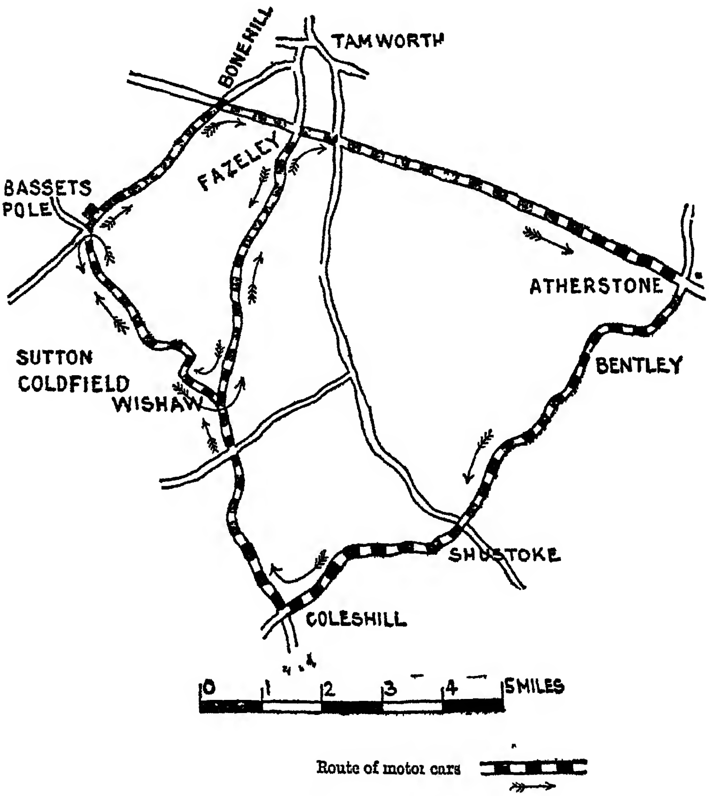


Fig. 1.—Sketch map of the roads selected for the trials.

On Tuesday, June 14, a longer run, over a course 46 miles in length, was made. The weighing of the cars, loads, fuel, &c., was accomplished under Mr. Courtney's supervision, in the Showyard at Four Oaks Park, on Monday morning, and the cars were sent on to the starting-point of the trials at Bassett's

Pole, about $2\frac{1}{2}$ miles distant. Fig. 4 is a sketch map of the roads selected for the trials. The district is hilly, but the weather was very fine, and the roads were in good condition. The roads are rough country roads, occasionally having a loose surface.

Figs. 5, 6, 7, 8 give a section of the road over the complete route, prepared by Mr. Courtney from the levels given in the Ordnance Survey. Fig. 5 and the upper part of fig. 6 correspond to the route of $13\frac{1}{4}$ miles traversed on the Monday from Bassett's Pole back to Bassett's Pole. On the Tuesday this route was also travelled over, after which there was 8 86 miles of reverse running from Bassett's Pole to Fazeley, making 22 11 miles. Consequently, the first mile marked on the next part of the section, fig. 6, near the Tamworth and Dosthill cross-roads, is the twenty-third mile of the second day's route. The severest gradients were near Bentley, between the thirtieth and thirty-second mile of the second day's route. Fig. 9 gives a section of this part of the road, plotted from a special survey. The gradients have been marked for each 100 feet of distance.

It will be seen that the maximum gradient in a short distance was 1 in 9. There were several short distances with gradients of 1 in 10, 1 in 12, 1 in 14, and less.

On Monday the run was a preliminary one of $13\frac{1}{4}$ miles over the course from Bassett's Pole, by Bonehill, Fazeley, and Wishaw, back to Bassett's Po.e. On Tuesday the long run was undertaken over a course 46 miles in length. The course of $13\frac{1}{4}$ miles traversed on the previous day was first travelled over. Then, turning round at Bassett's Pole, the cars went by Wishaw to Fazeley, along the Watling Street to Atherstone, thence over the severe gradients at Bentley to Shustoke, Coleshill, Wishaw, and back to Bassett's Pole. By a misunderstanding, those in charge of the Chiswick car treated Moxhull Corner, 4 miles short of Bassett's Pole, as the termination of the run.

Weights of the Vehicles and Loads.

On Monday morning, in the Showyard, under the direction of Mr. Courtney, the vehicles were weighed, (1) unloaded, (2) with two attendants and stores ready for running, and (3) with the load of sand bags which their owners declared as their running load.

Daimler Motor Co.

	t.	c.	q.	lb.		tons
Weight of vehicle empty	1	3	1	2		
„ with two attendants . . .	1	9	1	0	–	1·462
„ of load		19	1	14	=	0·969
Total running weight	2	8	2	14	=	2·431

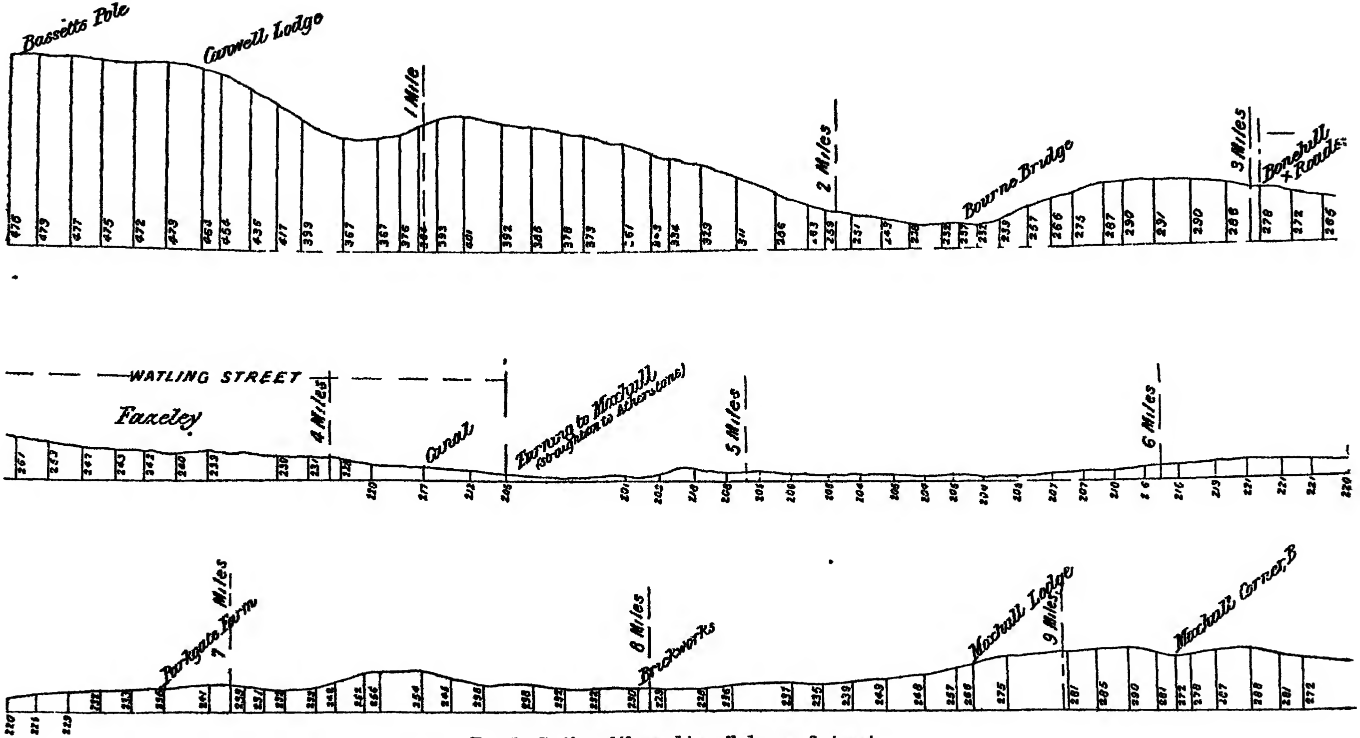


FIG. 5.—Section of the road travelled over—first part.

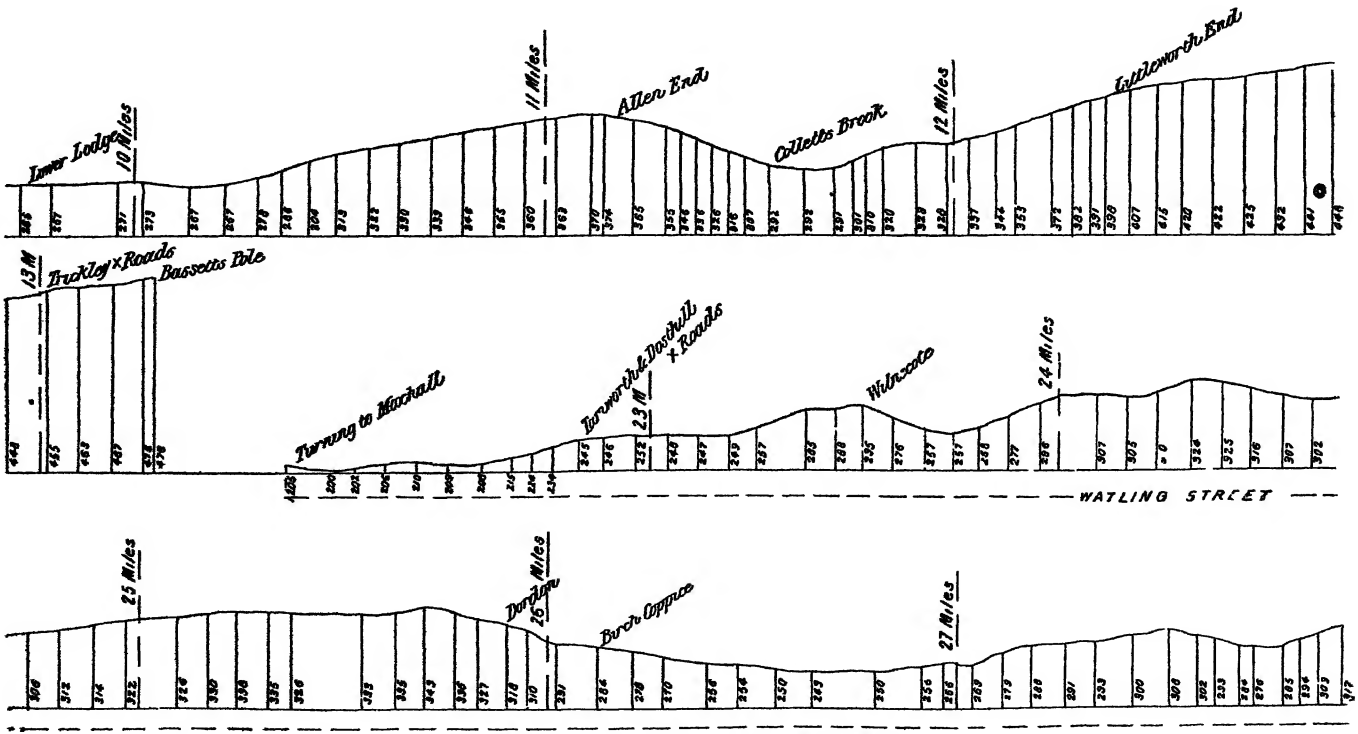


FIG. 6.—Section of the road travelled over—second part.

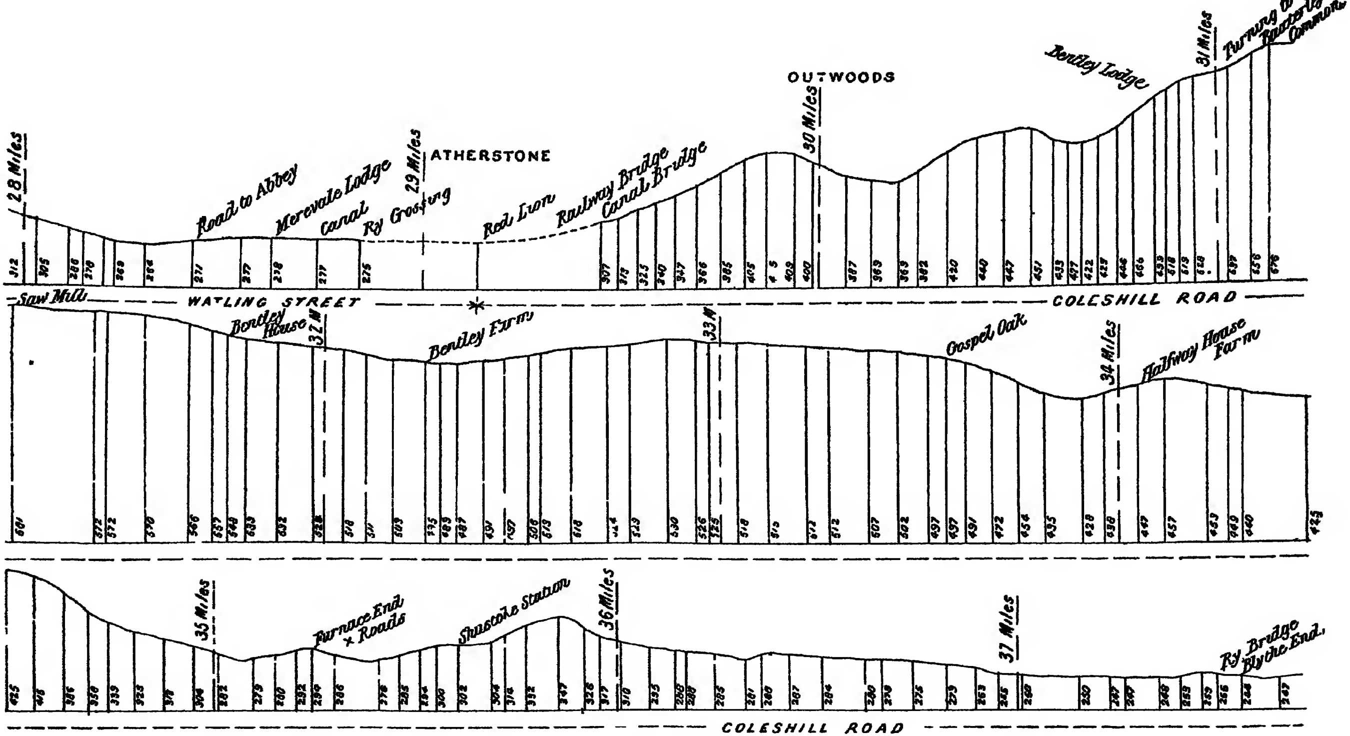


FIG. 7.—Section of the road travelled over—third part.

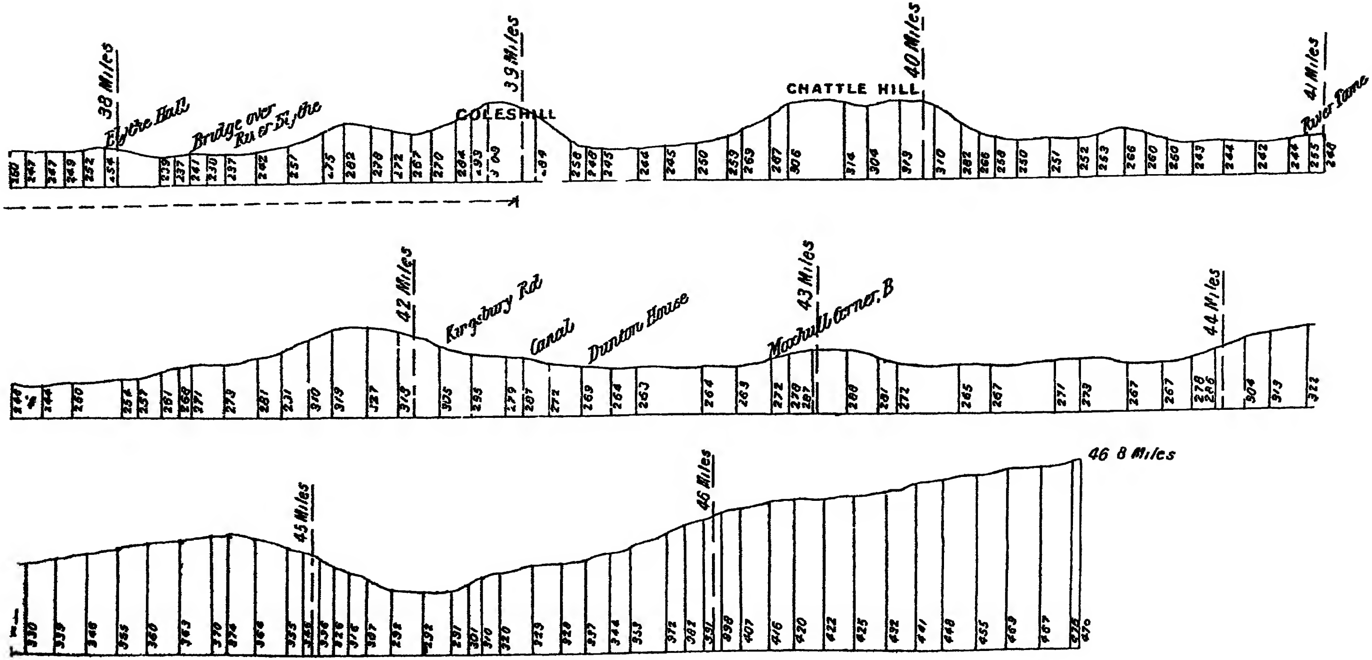


Fig. 8 —Section of the road travelled over—fourth and last part.

This was the load on the first day's run. On the long run on the second day the total weight, with an extra attendant and stores, was increased to 2 tons 9 cwt. 3 qrs. 7 lb. = 2·490 tons.

Lancashire Motor Co.

	t.	c.	q	lb.		tons
Weight of vehicle empty	2	17	1	14		
„ with two attendants and stores .	3	7	1	14	=	3·369
„ of load	3	1	2	7	=	3·078
Total running weight	6	8	3	21	=	6·447

The total weight was increased on the long run of the second day's trials to 6 tons 10 cwt. 3 qrs. 7 lb. = 6·540 tons.

Steam Carriage and Waggon Co., Chiswick.

	t.	c.	q.	lb.		tons
Weight of vehicle empty	3	0	0	21		
„ with attendants and stores . .	3	16	3	0	=	3·837
„ of load	2	19	2	16	=	2·983
Total running weight	6	16	1	16	=	6·820
On the second day the total weight was	6	17	2	7	=	6·878

The attendants and stores cannot be reckoned as part of the effective load. Hence the ratio of effective load to gross running load was as follows:—

	$\dfrac{\textit{Effective Load.}}{\textit{Total Running Load.}}$ First day	Second day
Daimler	0·39	0·39
Lancashire	0·48	0·47
Chiswick	0·44	0·43

FIRST DAY'S TRIALS. SHORT COURSE.

The trials on Monday were over a circuit of very approximately $13\frac{1}{4}$ miles, from Bassett's Pole by Bonehill, Fazeley, Wishaw, back to Bassett's Pole.

Daimler Motor Company, London.—The van started from Bassett's Pole at 1 hour $10\frac{3}{4}$ min. P.M. It ran without a stop the whole circuit, except a stop of a minute on a canal bridge, and reached Bassett's Pole at 2 hours $39\frac{1}{2}$ min. The net running time was therefore 1 hour $27\frac{3}{4}$ min., and the mean speed 9·23 miles per hour. So far as the rough time observations in transit, when passing mile posts, can be trusted, the greatest speed on the run was from 10 to 11 miles an hour. The run was made without the slightest hitch or difficulty.

Lancashire Steam Motor Company, Leyland.—The motor car was started from Bassett's Pole at 2 hours 45 min. P.M., and ran the circuit with stoppages aggregating 17 min., reaching Bas-

sett's Pole at 5 hours 23 min. The stoppages consisted of a delay of 8 min. at the third mile post, due to failure to take the right turn of the road; a delay of 3 min. at the sixth mile post to clean the petroleum burner under the boiler; and two stoppages of 3 min. each to raise the steam pressure, owing to the air-compressing pump working badly. The net running time, deducting these stoppages, was therefore 2 hours 21 min.; mean speed, 5·74 miles per hour. The fastest speed on the run was from 7 to 8 miles an hour. Except that the compressing-pump

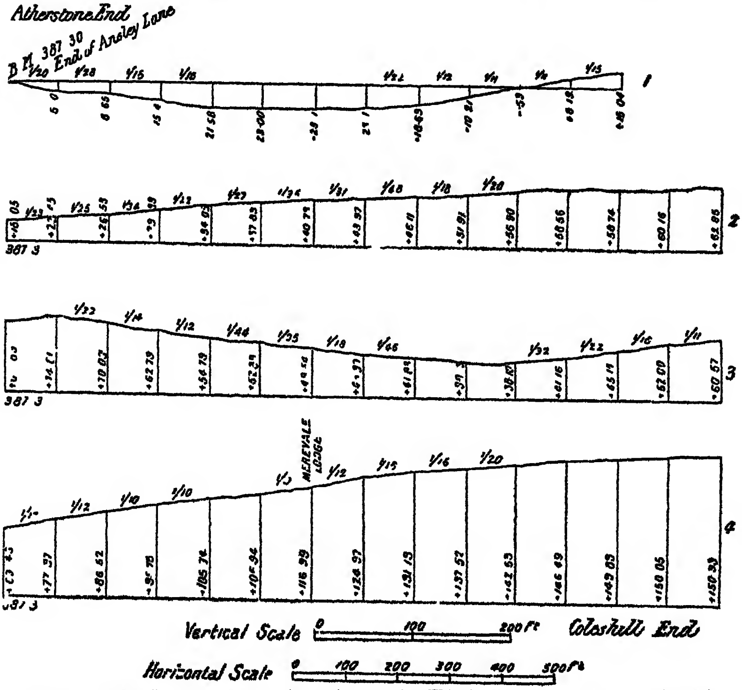


FIG. 9.—Levels and gradients of road near the Bentley Hills between Atherstone and Coleshill.

was not quite rightly adjusted to keep up the air-pressure the run was made without a hitch.

Steam Carriage and Waggon Company, Chiswick.—The motor car started from Bassett's Pole at 2 hours 17 min. P.M., and returned at 4 hours 36½ min. There was one stop of a minute due to a horse passing, a stop of 12 min. to tighten the fan-strap at about 10 miles from starting, and a stop of nearly 5 min. at the twelfth mile to clean the fire. Altogether, the delays amounted to 17¾ min., and the net running time was 2 hours 1¾ min.; mean speed of running, 6·66 miles per hour. The greatest speed

on the run was about 7½ miles per hour. The only defect shown in the running was the slipping of the fan-belt.

The first day's runs were made by all the self-moved vehicles quite satisfactorily, the slight defects shown by the steam vehicles being of a trivial character. The speed of the Daimler with its 1-ton load was remarkable, and the uniformity of speed throughout the run very satisfactory.

Second Day's Trials. Long Course.

The course of 46 miles for the second day's trials was over the first day's course, and then from Bassett's Pole by Wishaw, Fazeley, Atherstone, Coleshill, and back to Bassett's Pole. The distances may be taken to be as follows:—

	Miles
Bassett's Pole round to Bassett's Pole	13·25
Bassett's Pole, reverse running to Fazeley	8·86
Fazeley to Atherstone	6·89
Atherstone to Moxhull Corner	13·86
Moxhull Corner to Bassett's Pole	4·00
Total . .	46·86

Owing to a misunderstanding of the observer in charge of the Chiswick car, the run of that car ended at Moxhull Corner—a total run of 42·86 miles only.

Daimler Motor Company, London.—The van started from Bassett's Pole at 9 hours 54 min. A.M., and again reached Bassett's Pole at 11 hours 26¼ min. without a stoppage on the way. The net running time for the 13¼ miles was, therefore, 92¼ min., and the mean speed 8·62 miles per hour. From Bassett's Pole the van ran by Moxhull Corner to Fazeley and Atherstone, which was reached without a stop at 1 hour 17 min. The net time for the distance of 15·75 miles was 110¾ min., and the mean speed 8·53 miles per hour. At Atherstone the van waited, by direction of the Judges, till the other vans arrived, in order that they might see the behaviour of the motor cars on the steep inclines at Bentley. At 4 hours 14½ min. P.M. the van started again. Very satisfactory trials were made of starting, stopping, and backing on one of the steep inclines near Merevale Lodge. The van then continued the journey, reaching Bassett's Pole at 6 hours 51 min. P.M. The gross running time, deducting the ordered stoppage at Atherstone, was therefore 359½ min. There were no stoppages on the road, so that the net running time was 359½ min., and the mean speed for the whole run was 7·82 miles per hour. The motor was perfectly equal to the work set for it, and the run was effected with the greatest regularity and without a single hitch of any kind.

Lancashire Steam Motor Company, Leyland.—The air-compressing pump which was out of adjustment on the previous day had been put right, and it gave no trouble in the run over the long course. The vehicle started from Bassett's Pole at 9 hours 55 min. A.M., and got back there at 12 hours 5 min. P.M. There was a delay of 1½ min. caused by a horse and trap, one of 1½ min. to screw up union to exhaust, and one of 8½ min. to refix a key in one of the gear wheels. Hence the net running time for the 13¼ miles was 118½ min., and the mean speed 6·71 miles per hour. At Bassett's Pole there was a delay of 29 min., and the car restarted at 12 hours 34 min. P.M., reaching Atherstone at 3 hours 18 min. During this run there were some small stoppages caused by other vehicles, and a stop of 27 min. to refix key in gear wheel and tighten two nuts on frame. Net running time, deducting stoppages, 134½ min.; mean speed, 7·02 miles per hour. Water and stores were taken at Atherstone, and, by order, the restart was made at 4 hours 35 min. A delay of 3 min. occurred almost immediately to tighten a nut, and the slowest gear was put in for the steep gradients. At 6 hours 8 min. there was a stop of 5 min. to get water; at 7 hours 14 min. a stop of 5 min. to replace cotter in air-pump rod; at 7 hours 35 min. a stoppage of 8½ min. to take water; and at 7 hours 52 min. one of 2½ min. to attend to petroleum burner. Bassett's Pole was reached at 8 hours 5 min. P.M. The net running time for the whole run of 46·86 miles was 433¾ min.; mean speed, 6·48 miles per hour. There were no serious mishaps in the run of this vehicle, and the motor worked very well. There were in all four stops to get water, and oil was taken on board once. The slacking of nuts and cotters, though trivial in itself, might lead to serious accident if not noticed soon enough, and that such small mishaps occurred seems to show that the car was not quite well prepared for such a competitive trial. The steam pressure was generally well maintained, but it fell occasionally to 120 or 133 lb. per sq. in., and sometimes was allowed to reach 240 and 265 lb. per. sq. in.

Steam Carriage and Waggon Company, Chiswick.—The vehicle started at 9 hours 51 min. A.M., and returned to Bassett's Pole at 12 hours 49 min. The delays were 7 min. at the ninth mile to clean the fire, one of 14 min. at the twelfth mile to take water, and one of 7 min. from a front wheel getting into a rut or skidding and the vehicle running into the bank. Then, soon after, 22 min. were lost in raking out the fire and restarting it under the idea that a tube had burst, which, however, was not found to be the case. The net time for the 13¼ miles was

127 min.; mean speed when running, 6·26 miles per hour. Coal and water were taken in at Bassett's Pole, and the car started again at 1 hour 8 min. P.M. On the way to Atherstone there were delays of 13 min. from a front wheel skidding as before, 3 min. to tighten belt of fan, and 25 min. to get water at 3 hours 21 min. Atherstone was reached at 4 hours 20 min.

The net running time for the 15·75 miles was 148½ min.; mean speed, 6·36 miles per hour. Up to now the car had done very well, but beyond this point it got into some difficulties. It was really overloaded for the gradients it had to encounter and the gear ratio provided. The start was made from Atherstone at 4 hours 32 min., with the steep gradients at Bentley to be attacked. There was a stop of 2 min. on the first hill, another of 2 min. to make steam, and then the hill was surmounted. Shortly after there were stops of 2, 3½, and 8 min. to make steam, and a stop of 7 min. to clean the fire. At 7 hours 9 min. the car unfortunately took a wrong turning, and 34 min. were wasted off the proper course. At 7 hours 44 min. the car stopped on a bad hill with loose surface. The driver took off the cover of engine casing and found nothing wrong. He then elected to remove part of the load and return for it. At 9 hours 14 min. Moxhull Corner was reached, which was taken to be the end of the run. Deducting the time when the car was off the course, the gross time from Bassett's Pole to Moxhull Corner (42·86 miles) was 10 hours 49 min., and the net running time, after deducting all stoppages, 6 hours 55 min.; mean speed while running, for the whole distance, 6·20 miles per hour.

Excepting the slipping of the fan-belt, there were no mishaps due to mechanical defects. The motor ran very well, but, even with steam admitted to the low-pressure cylinder, the gearing ratio was too high for the load on some of the gradients. It was stated that the car had been designed for a less load on more moderate gradients. No doubt, under such conditions, it would have maintained a very good speed and worked without a mishap.

Summary of Times and Speeds.

In the Table opposite the gross and net running times are set forth for comparison. The net running times are the actual running times after deducting all stoppages. The gross times have been reckoned in this way. It seemed undesirable to attempt any discrimination of stoppages due to any fault or

Running Times and Speeds.

	Distance, miles	Gross running times, in minutes			Net running times, in minutes			Speed in miles per hour, reckoned on gross times			Speed in miles per hour, reckoned on net times		
		Daimler	Lancashire	Chiswick	Daimler	Lancashire	Chiswick	Daimler	Lancashire	Chiswick	Daimler	Lancashire	Chiswick
SHORT COURSE —													
Bassett's Pole to Bassett's Pole . .	13.25	88¾	158	139½	87¾	141	121¾	8.96	5.03	5.70	9.06	5.64	6.53
LONG COURSE —													
Bassett's Pole to Bassett's Pole .	13.25	92¼	130	178	92¼	118½	127	8.62	6.11	4.47	8.62	6.71	6.26
Bassett's Pole to Atherstone . .	15.75	110¾	164	192	110¾	134½	148½	8.53	5.76	4.92	8.53	7.02	6.36
Atherstone to Moxhull Corner . .	13.86	—	—	248	—	—	139½	—	—	3.35	—	—	5.96
Atherstone to Bassett's Pole . .	17.86	156½	210	—	156½	180¾	—	6.85	5.10	—	6.85	5.93	—
Total run to Moxhull Corner . .	42.86	—	—	613	—	—	415	—	—	4.16	—	—	6.20
Total run to Bassett's Pole . . .	46.86	359½	502½	—	359½	433¼	—	7.82	5.60	—	7.82	6.48	—

defect of the vehicle and stoppages due to other causes, nor would any sensible difference have been made by doing this. But the stoppages at Bassett's Pole and Atherstone on the second day's run have been deducted, and also the times when, by misunderstanding the route, a vehicle was off the course prescribed.

Taking the net times and speeds, it will be seen that the light load Daimler has a considerable advantage over the more heavily loaded vehicles, and on the gross times and speeds its advantage is still greater. Of the two steam-driven vehicles, there is no very great disparity in the net times and speeds reckoned on the net times of running. But the Chiswick vehicle had a more serious tale of stoppages, and, on the gross times and speeds reckoned from them, the Lancashire Motor Company's car has a considerable advantage. On the short run on the first day the Chiswick car did better as to times and speeds than the Lancashire car.

Consumption of Fuel and Cost of Running.

The following Table gives the data of the amount of fuel used, the amount of water used, and the calculated cost of running. Benzoline is taken to cost $7\frac{1}{2}d.$ a gallon; lamp oil, such as was used by the Lancashire car, $4\frac{3}{4}d.$ per gallon; coal, 20*s.* a ton:—

Consumption of Fuel and Water.

——		Daimler	Lancashire	Chiswick
Short Course:—				
Total weight of car and load . .	tons	2 43	6 45	6 82
Coal used	cwt	—	—	1·37
Burning-oil used	gallons	0 63	7·50	—
Water used	,,	none	45	50
Cost of fuel for journey . . .	pence	4 7	35·6	16·4
,, ,, per mile	,,	0 355	2 69	1 24
,, ,, per ton per mile . . .	,,	0 146	0 416	0·181
,, ,, per ton of cargo per mile .	,,	0 366	0 873	0 415
Long Course:—				
Total weight of car and load . .	tons	2·49	6·51	6·88
Coal used	cwt.	—	—	7·5
Burning-oil used	gallons	2·81	23 5	—
Water used	,,	13	165	193
Cost of fuel for journey . . .	pence	21·1	111 6	90
,, ,, per mile	,,	0 45	2·38	2·10
,, ,, per ton per mile . . .	,,	0 18	0·36	0·30
,, ,, per ton of cargo per mile .	,,	0 465	0·774	C·701

It would appear from this that there is not much difference of cost of running, reckoned per ton of total weight of vehicle or

per ton of cargo, whether an oil engine with benzoline or a steam engine with coal is used. It is true that on the long course the cost for coal comes out higher, but this was probably due to fuel consumed in exceptional stoppages. On the other hand, the cost of oil used to raise steam appears to be distinctly greater than the cost of coal, though not by any very serious percentage.

Coefficient of Performance.—The work of a motor car is to carry a cargo a given distance in the shortest time. If a car carries twice as much load as another, it does twice as much work. If it carries a load in half as much time as another, it can make twice as many journeys, and will do twice as much work. Hence the coefficient of performance may be reckoned in ton-miles of cargo per hour. The following Table gives this coefficient calculated for both runs, and for the gross and net times of running. Strictly, no doubt, the coefficient of performance should be reckoned on the gross time of running, excluding unnecessary stoppages. But in these trials the gross times do not, perhaps, quite fairly represent the best performance of the cars in normal conditions of work. In taking the cargo weights, the weight of an observer has been allowed as part of the cargo weight.

Coefficient of Performance.

—	Ton miles of cargo per hour		
	Daimler	Leyland	Chiswick
Reckoned on gross running time			
Short course	9 30	15 81	17 40
Long course	8 12	17 62	12 70
Reckoned on net running time:			
Short course	9 30	17 74	19 93
Long course	8 12	20 38	18 92

The coefficient of performance of the Daimler is of course lower than that of the other cars, as it is a smaller machine. Reckoning on the net times, the coefficient is nearly the same for the two steam vehicles. Reckoning on the gross times, the coefficient is low for the Leyland on the short course, when it suffered from the bad adjustment of the air-compressing pump. The coefficient for the Chiswick car is very low for the long course, in consequence chiefly of its being rather overloaded for the heaviest gradients met with. Other things being the same, the cost of a car should vary directly as the coefficient of performance. In respect of cost the Leyland has a very good position. Its cost is little more than that of the Daimler, and its coefficient of performance rather more than twice as great.

Horses' Power Exerted by the Cars.—From the ascertained frictional resistance the effective horse-power of the cars can be estimated. The following Table gives the effective horse-power for each car running on the level, at the mean speed observed on the long course. The horse-power has also been calculated for an up-gradient of 1 in 12, on the assumption that the car could take such a gradient at half the mean speed observed on the long course. This last calculation depends on an assumption, but it is instructive as showing how greatly the gradient resistance affects the question of the power to be provided.

Effective Horses' Power Exerted.

—	Daimler	Leyland	Chiswick
Total weight . . . . . tons	2·49	6·54	6 88
Coefficient of friction	$\frac{1}{44}$	$\frac{1}{27}$	$\frac{1}{31}$
Resistance on level . . . . lb.	126·8	512 6	497·2
Net mean speed . . miles per hour	7 82	6 48	6 20
" " " . . ft. per sec.	11·47	9 50	9 09
Effective horse-power on level . . .	2 61	9 38	8·20
Resistance due to gradient . . lb	464 8	1221 0	1284 0
Total resistance on gradient . . "	591·6	1763 6	1781·2
Assumed speed on gradient ft. per sec.	5·73	4·75	4·54
Effective horse-power on gradient . .	6·16	15 23	14 72

Gravity Trials. Experiments on the Friction of the Self-moving Vehicles.

For such vehicles as were used in these competitive trials, and for the speeds suitable to them, the chief part of the power expended is used in overcoming the vehicle friction and the machinery friction. It appeared to the Judges that it would be useful to make some trials of the friction of these cars, and that a measure of the friction might be obtained by allowing them to run down a hill by gravity (the motor being idle) and noting the speed acquired and the distance in which they came to rest.

On the third day of the trials the motor cars were run out to Bassett's Pole, loaded as when running on the previous day. On the road between Bassett's Pole and Bonehill there was a dip very suitable for these trials. This portion of the road was levelled, and marked out in 100 ft. distances.

The total weights of the cars and loads in these trials were the following:—

	Tons
Daimler	2·43
Lancashire	6·40
Chiswick	6·57

Levelling of Road.—The subjoined Table gives the distances taken with a 100-ft. chain and the levels observed:—

Distance, feet	Back sight	Fore sight	Difference, feet	Fall in feet from A	
0	2·15	—	—	0	Point *A*
100	1·30	9·00	6·85	6·85	
200	1·10	8·00	6·70	13·55	
300	1·40	8·01	6·91	20·49	
400	1·80	7·92	6·52	27·01	
500	2·70	7·20	5·10	32·11	
600	3·45	6·30	3·60	36·01	Point *B*
700	3·95	5·98	2·53	38·51	
800	5·65	3·92	−0·03	38·51	Point *C*
900	6·32	3·30	−2·35	36·16	
1,000	—	3·04	−3·28	32·88	

NOTE.—Milestone marked "Tamworth 4, Sutton 3" at 655 feet from *A*.

Method of Trials.—Each car was brought to one of the marked distances on the descending gradient, generally the point 300 ft. from *A*, but in trial three at 400 ft. from *A*. The car was then gently started from rest and allowed to descend the hill by gravity. As it passed over the 200 ft. length from *B* to *C* the time of passage was taken. The car was allowed to come to rest, stopping generally at a point beyond *C*, but in two trials a little short of *C*. From the speed over the base *B C* one measure of the friction can be obtained. The mean gradient from start to stop is another measure.

Friction Calculated from the Speed Observations.—Let W be the weight of the car in lb., h the fall in feet from the point where the car started to the middle point of the base *B C*. Then Wh foot-lb. is the work done by gravity on the car. Let v be the mean speed over the base *B C*, then $Wv^2/2g$ is the approximate kinetic energy of the car at the middle point of *B C*. Now let f be the total friction of the car reckoned in lb. per lb. of the car's weight, and s the distance from the starting point to the middle point of *B C*. Then fWs is the work expended in friction in foot-lb.

$$Wh - \frac{Wv^2}{2g} = Wfs$$

$$f = \frac{h - \frac{v^2}{2g}}{s}.$$

2240 f is the friction of the car reckoned in lb. per ton. Also $1/f$ is the gradient due to the friction, that is the greatest gradient on which the car would stand without moving, or if

put in motion would run without acceleration. The following Table gives the values of the friction calculated from the observations:—

Gravity Trials. Speed Observations.

No. of run	s Distance from starting point to middle of base BC, ft.	l Length of base BC for which time of passage was taken, ft.	t Time over base, sec.	$l/t=v$ Mean speed over base, ft. per sec.	h Fall from starting point to middle of base BC, ft	$\frac{v^2}{2g}$	f Friction of vehicle in lb. per ton	i Gradient corresponding to friction	
				Daimler Motor Company, London.					
2	400	200	10	20·00	16·77	6·23	58·9	1 in 38	Mean 1 in 45
4	300	200	$11\frac{4}{5}$	16·94	10·25	4·16	43·2	1 in 52	
3	400	200	$9\frac{2}{5}$	21·27	16·77	7·04	51·4	1 in 41	
				Lancashire Steam Motor Company, Leyland.					
5	384	168	$21\frac{1}{5}$	7·93	16·77	0·98	92·0	1 in 24	Mean 1 in 25
7	396	$192\frac{1}{2}$	22	8·75	16·77	1·19	88·0	1 in 25	
9	400	200	18	11·11	16·77	1·92	83·1	1 in 27	
8	400	200	$11\frac{2}{5}$	17·54	16·77	4·79	67·0	1 in 33	
				Steam Carriage and Waggon Company, Chiswick.					
10	400	200	$14\frac{2}{5}$	13·89	16·77	3·00	77·0	1 in 29	Mean 1 in 29
11	400	200	15	13·33	16·77	2·76	78·4	1 in 29	

NOTE.—In run three with the Daimler car the engine, but not the gearing, was disconnected. In run eight with the Leyland car the engine was disconnected.

It will be seen that the Daimler car had the least friction—viz., $\frac{1}{45}$th of its weight, or 51 lb. per ton. The Thornycroft car had a friction of $\frac{1}{29}$th of its weight, or nearly 78 lb. per ton. The Leyland car had a friction of $\frac{1}{25}$th of its weight, or nearly 88 lb. per ton. With the engine disconnected the Daimler car had a friction amounting to $\frac{1}{41}$ of its weight, and the Leyland car had a friction amounting to $\frac{1}{33}$rd of its weight, or 67 lbs. per ton. The engine of the Thornycroft car could not be disconnected.

From the difficulty of getting the speed quite accurately, and also to some extent because the method of calculation is approximate, probably these results are not quite so trustworthy as those which follow, in which the friction is calculated from the distance from starting to stopping.

Friction Calculated from Distance of Running from Starting to Stopping.—Let s be the total distance the car ran, and h the fall of level in that distance. Then h/s is the gradient due to friction, and corresponds to $1/f$ in the previous calculation.

The following Table gives the results of the observations calculated in this way. It will be seen that they differ only slightly from the previous results :—

Gravity Trials. Mean Gradient from Starting to Stopping.

No. of run	Starting point, distance from A, in feet	End of run, distance from A, in feet	Length of run, in feet	Levels at starting point	Levels at stopping point	Difference, fall in length of run	Mean gradient from start to stop	
			s			h	$\frac{h}{s}$	
			Daimler Motor Company, London.					
2	300	906	606	20·49	35·97	15·48	1 in 39	Mean 1 in 41
4	400	875	475	27·01	36·75	9·74	1 in 49	
3	300	923	623	20·49	35·41	14·92	1 in 42	
			Lancashire Steam Motor Company, Leyland.					
5	300	768	468	20·49	38·52	18·03	1 in 26	Mean 1 in 27
7	300	792½	492½	20·49	38·51	18·02	1 in 27	
9	300	802½	502½	20·49	38·51	18·02	1 in 28	
8	300	877½	577½	20·49	36·69	16·20	1 in 35	
			Steam Carriage and Waggon Company, Chiswick.					
10	300	838	538	20·49	37·62	17·27	1 in 31	Mean 1 in 31
11	300	832	532	20·49	37·76	17·13	1 in 31	

NOTE.—In trial three with the Daimler car the engine, but not the gearing, was disconnected. In trial eight with the Lancashire car the engine was disconnected.

Fig. 10 shows a section of the road and mean gradient of the cars for each run.

General Conclusions.

The Daimler car, the only representative of the Light Load Class, went through all its trials in the most satisfactory way. It is clear that this type of motor car has been brought to a completely practical shape, and that, in the hands of a competent driver, it will do all that was asked of it in these trials economically, at good speed, and without accident or delay. The car was admirably driven in the trials.

Motors of this type have unquestionably established a position, and have found a field of usefulness. They have two inherent disadvantages which limit their application without preventing their employment under suitable conditions. One is that they use as fuel a light oil, not generally procurable without prearrangement, and dangerous in the hands of careless or ignorant persons. The other is that an internal combustion engine is almost necessarily more complicated and delicate in its adjustments than engines working with steam, and requires

greater skill, or greater observation and resource, in the driver managing it.

As to the two steam-driven vehicles in the Heavy Load Class, the first important difference is that one used for fuel an ordinary petroleum oil and the other coal. The oil fuel is lighter to carry, and has some advantage in permitting a limited amount of automatic regulation. On the other hand, it is liable to cause some nuisance, when taken on board, from spilling. Further, though the petroleum burner on the Lancashire van worked very well in these trials, it is known that such burners occasionally clog, and when the burner acts imperfectly a pungent smoke is produced. However, petroleum was used very satisfactorily in these trials. Coal, used in the Chiswick van, is everywhere obtainable, and there does not appear to be any difficulty in working a motor car boiler, with reasonably good coal, without much trouble to the attendants, and without sensible nuisance from smoke. With a fan and a damper the rate of generating steam seems to be very nearly as much under control as when liquid fuel is used.

Both the steam vehicles suffered somewhat from trivial defects, slacking of cotters, slipping of a belt, &c., which, with further experience, will no doubt be obviated.

The Lancashire van, on the whole, accomplished the long course with the least difficulty and the fewest delays. The reason of this was pretty obvious. The Lancashire van had a variable speed gear giving three changes in the velocity ratio of engine and road wheels. The Chiswick van had no variable gear, and had only the engine to depend on for variation of speed and power. On a fairly good road, without too heavy gradients or too heavy a load, the Chiswick car would probably have had the advantage. For the road traversed in these trials and for the load the car was carrying, there was no doubt that the Lancashire car had the advantage. It was only with great difficulty that the Chiswick car surmounted the Bentley inclines. If a load of 2½ tons instead of 3 tons had been declared, probably this difficulty would hardly have been noticed. Or, if there had been a two-speed gear, probably no difficulty would have been experienced. A variable speed gear is a complication makers would be glad to dispense with. The lesson of these trials seems to be that, for such loads and such gradients as were employed, a two-speed gear is necessary. Whether a three or four speed gear is desirable is doubtful. Of course it is only vehicles for carrying heavy loads which are in question, and for oil-engines as distinguished from steam-engines the variable speed gear is always necessary.

On the whole, the two heavy load vehicles which competed in these trials may be said to have shown that self-moving

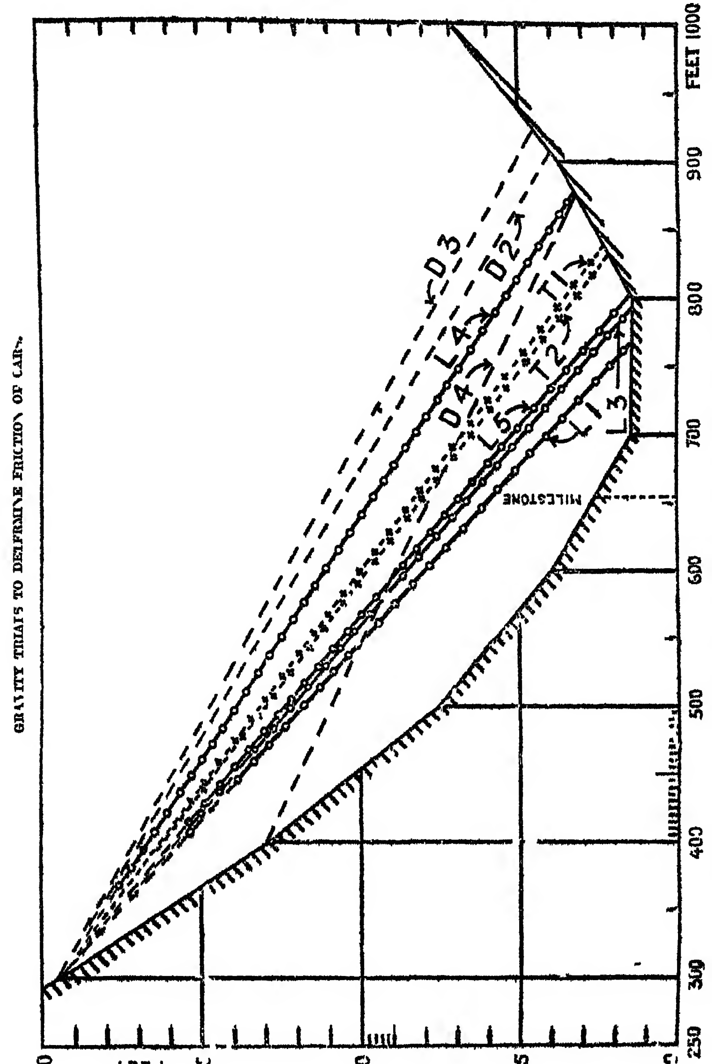


FIG. 10.—Runs with motor cars on road near Bassett's Pole.
D, Daimler Car, L, Leyland Car, T, Chiswick Car. L 4 and D 3 are runs with engine dis-connected.

vehicles worked by steam are capable of carrying 3-ton loads, at good speed and very economically, on country roads of no specially good surface, and up gradients of 1 in 12 or 1 in 9.

Such trivial defects as were found were clearly capable of being obviated, and if the competitors had tried the road beforehand probably delays due to such causes would not have occurred. Both vehicles were regarded by the Judges as having succeeded in passing the tests applied.

So far as could be judged, all the vehicles had sufficient brake power even for the steepest gradients.

The Judges decided to recommend that a 1st Prize in the Light Load Class should be awarded to the Daimler Company, London; and that a 1st Prize in the Heavy Load Class should be awarded to the Lancashire Steam Motor Company, Leyland, and a 2nd Prize to the Steam Waggon and Carriage Company, Chiswick.

W. C. Unwin.

Palace Gate Mansions, Kensington, W.

Notes by the Society's Consulting Engineer on the Competition of Self-moving Vehicles in 1897.

It will be remembered that, in connection with the Manchester Meeting of 1897, prizes of the same amount as those offered at the Birmingham Meeting this year, and under similar regulations, were offered by the Society for Self-moving Vehicles adapted for the carriage of agricultural produce along ordinary roads.

Only one vehicle, constructed by the Lancashire Steam Motor Company, appeared before the Judges on the day of the trial (June 10, 1897), and as this car failed to complete its run, no award was made by the Judges. The immediate cause of the failure was the difficulty of steering, owing to the seizing of the compensating driving gear; but as in many respects the working of the vehicle was satisfactory, and showed promise of future development, the Judges, while unable to award the Special Prize offered, recommended that the attention of the Judges of Miscellaneous Implements should be called to it during the Manchester Meeting, when, if the defect above referred to was remedied, the vehicle might be considered of sufficient merit to receive one of the Society's Silver Medals, awarded to New Implements. The vehicle was subsequently exhibited at Manchester, and tried by the Judges of Miscellaneous Implements, who awarded it a Silver Medal.

No report of these trials was made at the time, nor was a description of the vehicle published; as, however, a very similar machine by the same makers has this year gained the award in the class for the heavier vehicles, it may be of interest briefly

to describe last year's machine and trials, and to compare the conditions under which the respective trials were made.

In 1897 prizes were offered for two classes, viz.:—

Class I. to carry loads not exceeding 2 tons.
Class II. to carry loads of 4 tons.

Every latitude was given as to the nature of the motive power employed. In regard to petroleum used in the engines, no restrictions were made beyond the regulations issued by the Home Secretary, under Section 5 of the "Locomotives on Highways Act, 1896," so as not to exclude engines using light oils from the competition.

The regulations set out that trials were to "be made of the competing vehicles carrying a declared weight for an ordinary load over a distance not less than fifty miles out and fifty miles return."

A course was selected, starting from the Crewe Arms Hotel to Derby *viâ* Congleton, Leek, Ashbourne, and back. The roads were good, and there were in places some steep gradients, notably in Congleton, where a hill paved with cobble stones had to be encountered.

Originally four vehicles were entered under these conditions. In Class I. there were three vehicles, which were described as follows in the specification of entry given by the makers:—

1. *Messrs. Coulthard & Co.*, Cooper Road, Preston.—"Motive power, steam. Weight, unladen, 35 to 40 cwt. Driven by small steam engine, high and low pressure, steam being generated by oil furnace."

2. *The Lancashire Steam Motor Co.*, Leyland, Lancs.—"Motive power, steam. Weight, unladen, 28 cwt., for light loads, to carry one ton of goods or parcels, fitted with patent oil fired boiler and compound steam engine. Steam generated by the use of common petroleum or lamp oil as fuel.

3. *The Anglo-French Motor Co., Ltd.*, Digbeth, Birmingham.—"Motive power, petroleum. Weight, unladen, about 50 cwt. A low-sided lorry for general purposes, fitted with double-cylinder motor, worked by petroleum, and driven by friction and spur-gearing. Fitted with two speeds and reverse motion." To carry one ton.

In Class II. the only machine entered withdrew at a very early period after entry.

The Judges were:—

Sir William Anderson, K.C.B., F.R.S., Woolwich Arsenal.
Mr. Bryan Donkin, M.Inst.C.E., Southwark Park Road, Bermondsey, S.E.
Mr. F. W. Webb, M.Inst.C.E., Crewe.

Of the three machines in Class I. only one put in an appearance on the morning of June 10, 1897, and this was the vehicle entered by the Lancashire Steam Motor Co.

Some doubt was felt by the exhibitor as to the expediency

of starting. He had only arrived at Crewe the previous evening, having made a "maiden" trip by road from Leyland. This apparently was not without incident, as he reported that he had had one of the crank brasses broken, and that he had had some difficulty with his steering gear during the latter part of the journey.

As there was but one vehicle, the Judges, after examination of it, came to the conclusion that it would be advisable to modify the programme, and in the first instance to have a preliminary run from Crewe to Congleton and back.

The exhibitor reporting that he had effected the necessary repairs and was ready to start, the vehicle was taken to the weighbridge and weighed. Its weight, with full charge of water, oil and attendant, was 1 ton 11 cwt. 2 qrs. 8 lb. The load carried was half a ton.

Nothing could be more favourable than the weather and condition of the road for the trial, and a start was made from the Crewe Arms Hotel at 10.30 A.M. for Congleton, the steam pressure being 200 lb. It very soon became evident that something was amiss with the steering gear. No less than seven stoppages occurred which were due to this cause. Nor was this the only defect which manifested itself, as at the connection between the exhaust pipe from the engine and the condenser there was a considerable leakage of steam, and this on one occasion was sufficient to extinguish the oil-flame under the boiler, and also accounted for the large consumption of water on the trial.

Congleton was reached at 1.18 P.M., the distance being about twelve miles. The gross running time was 2 hours 58 min., or, allowing 27 min. for stoppages of all kinds, say 2 hours 31 min. net time.

The actual consumption of water was 30 gallons; of oil, 3·9 gallons.

After this run the Judges decided that it was unnecessary to further continue the trial.

Description of the Motor Van of the Lancashire Steam Motor Co.

This is a covered four-wheeled spring van with body 10 ft. 6 in. long by 4 ft. 6 in. wide mounted on a steel frame.

The front wheels are 3 ft. dia., the rear wheels 4 ft. dia. with iron tyres 3 in. wide. The wheel base is 8 ft. 6 in., and the overall dimension across the wheels is 7 ft. In the fore part of the van, on one side, is fixed a small vertical multitubular steel boiler, the outside diameter of which is 28 in., and in which there are 108 vertical taper tubes through which the hot gases pass, the tubes being $1\frac{1}{4}$ in. dia. at the fire box and $\frac{1}{2}$ in. dia. at the crown end. The total heating surface is about 34 square feet.

The boiler is fired with oil, the supply of which is carried in a cylindrical

vessel fixed below the fore part of the body of the van, and is forced through the burner by compressed air.

On the other side of the van is fixed a small vertical compound engine, the high-pressure cylinder of which is $2\frac{1}{4}$ in. dia., and the low pressure $3\frac{3}{4}$ in., each having a stroke of 4 in.; both these cylinders may be worked high pressure when necessary. The normal speed of the engine is stated to be 400 revolutions per minute, but looking at the ratio of the gearing it would appear that a very much slower ratio would be sufficient. The crank shaft is carried right across the body of the van, and on it are mounted a chain wheel to drive on to the countershaft for reversing, and also three pinions which gear direct on to the countershaft, giving the necessary slow, intermediate, and fast gears; these pinions and chain wheel on the countershaft are all mounted on spring clutches under the control of the driver. A third motion shaft, driven from the countershaft through compensating gear, has chain wheels mounted on either end, which, by means of pitch chains, drive the rear-road wheels of the van. A feed pump for the supply of the boiler and also a small air compressing pump for forcing the oil into the burner, are worked from the intermediate gear by the engine.

The exhaust steam from the engine is taken through an air condenser, fixed on to the roof of the van, consisting of a battery of sixteen rows of $1\frac{1}{2}$ in. Rowe's tubes of a mean length of 7 ft. 6 in., and being there condensed is returned in the form of water to the water tank underneath the van.

The driver sits in the front of the van where the regulating lever, clutch, brake and steering levers are conveniently arranged, close to hand, and where, through the space between the boiler and engine, he can get a view of the rear of the van.

The weights of the various parts are so adjusted that, when empty, the weights are approximately evenly distributed over the front and rear wheels, and as all additional weight when loaded comes on the rear wheels, a better grip is afforded to them, and a constant weight is maintained on the steering wheels.

The ratios of gearing between engine and the road driving-wheels are as follows:—

Slow gear revs. engine	400	Revs. driving wheels			13
Intermediate gear .	400	,,	,,	,,	31
Fast gear . .	400	,,	,,	,,	34

The oil used for the boiler may be any of the heavier oils with density of about ·8, and flashing point of 90° or upwards.

F. S. COURTNEY.

Broad Sanctuary Chambers, Westminster, S.W.

MISCELLANEOUS IMPLEMENTS EXHIBITED AT BIRMINGHAM.

THE display of miscellaneous implements at this year's Country Meeting in Four Oaks Park indicates that the popularity and usefulness of the Royal Show, from the implement-maker's point of view, continue to be as great as ever, for there was a larger number of stands—namely 502—than in any previous year, with the exception of the record total at Windsor in 1889.

Despite the fact that the number of exhibitors was so large, it cannot be said that there were any very remarkable novelties, and it seems as if inventors were waiting for a lead to point out to them the direction in which to exercise their talents. Even the oil engine, which in past years has accounted for so many "new implements," appears to have followed the gas engine, and is rapidly becoming stereotyped into a few well-known forms, there having been only one oil engine entered this year as a "new implement." It is not easy to suggest any definite reason for this lull, but in a conversation I lately had with a maker I remarked on the absence of anything very striking or novel at the Royal Show, and his reply was that at his works they were so busy, and so hard pressed for delivery of goods, that they had no time to think of striking out in new lines. It is to be hoped that this is the general experience.

It must not, of course, be supposed that there have been no improvements made during the year that has elapsed since the Manchester Show. The improvements are, indeed, as numerous and ingenious as ever, but they mostly relate to the details of existing machines, and there is in progress a natural course of evolution which is perhaps of greater benefit to the farmer than the production of novelties. One of these minor improvements which will doubtless prove a great boon, both to man and horse, is the general introduction of roller bearings in reaping and mowing machines, with the result that the draught is considerably lessened and the wear and tear reduced.

What the next move is likely to be it is impossible to surmise, but it may be that the small exhibit of motor-vans is only the advance guard of a mighty host, and that in future years we may see a large part of the shedding taken up by self-moving vehicles of endless variety, until they, in their turn, have settled down into a few standard patterns.

Perhaps the most remarkable feature of the exhibit of agricultural machines properly so-called—that is, machines such as will be of use on a farm—is the extraordinarily low prices at which they are offered for sale. In looking closely into them an engineer cannot but be struck with the extreme ingenuity that is often displayed in so designing the machines that they can be produced at a minimum of cost.

Prime cost is a matter of the utmost importance in agricultural machines, which are generally lying idle and neglected for the greater part of the year, and which have to repay principal and meet interest on the capital expended in their purchase in the course of a comparatively few working days.

When it is considered that all parts have to be interchangeable, and that the selling prices will only admit of the minimum of finishing and machining, it is obvious that this class of machinery is the result of a vast amount of thought, backed by the highest mechanical skill and ingenuity.

The Silver Medal Awards.

My colleague, Mr. Baynton Hippesley, and myself examined carefully, with the assistance of the Society's Consulting Engineer, all the 80 exhibits entered as "new implements," and we recommended the award of the Society's Silver Medal in the case of each of the four appliances now to be noticed.

Article 596.—*Monorail Portable Railway Company*, 1 Frederick's Place, Old Jewry, London, E.C. "Monorail" Portable Railway Plant.—This is a railway reduced to its very simplest elements. Its chief feature is the employment of one line of rail in the place of two, as adopted on most light railways. The rail, instead of being attached to sleepers, is held in position by a number of steel sole-plates about nine inches in length, and placed about three feet apart; they lie on the surface of the ground, and can be secured in place by a peg driven into the ground. The rails are joined together by a fishplate which surrounds the lower face and sides of the rail.

At first sight the sole-plates appear to be insufficient, but a little consideration will show that the tendency of the cars to shift the rail can only be very slight. The cars, which are of various shapes and sizes, according to the material to be conveyed, run on two wheels of small diameter, one in front of and one behind the car-box, and, when in motion, are easily kept upright.

The motive power—whether manual or animal—is applied to a rod which projects from the back line of the car at right angles to the line of rail. This bar is telescopic, and can be lengthened at will to suit convenience; being of considerable length it acts as a lever, and renders it very easy to keep the car steady. The great advantage of the "Monorail" is that no road-bed requires to be made. The rail can be laid with very slight preparation, as it is only necessary to ensure that the sole-plates lie on even ground. In a fairly level country no earthworks or formations are required. As each car can carry a ramp turnout and a spare length of rail, it can be easily shunted to one side to allow the passage of any cars it may meet.

We were informed that the system has been tried under varying conditions with marked success, and I have no doubt that it will prove of great service for a variety of estate work,

especially when building operations are being carried on the duration of which would not justify the cost entailed in laying down a regular tramway.

Article 2033.—*Messrs. Vipan & Headly*, Church Gate Works, Leicester. Cream Separator, manufactured by The Centrator Co., Stockholm, No. 1 capacity, sixteen gallons per hour. Price 9*l*. 10*s*.—This machine has a horizontal separating "bowl," but its chief novelty lies in the manner in which it is driven. The axle on which the bowl is mounted is actuated by three steel rings, each of which is driven by an internal disc wheel mounted on a stud on a revolving disc, which is fitted on the inner end of a second motion spindle, at the outer end of which is a pinion driven by a large spur wheel, which is driven by the handle. The three steel rings are also in contact with the inside of a large stationary ring, concentric with the bowl shaft, and second motion spindle, the whole making a species of frictional sun-and-planet train, giving a high multiplication of speed with very smooth and silent running.

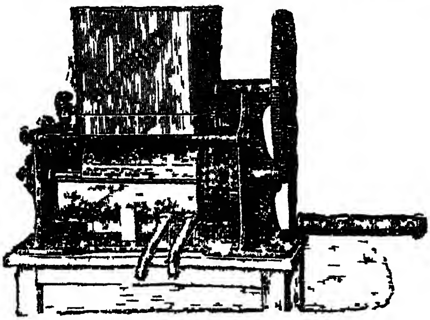


FIG. 1.—The "Centrator" Cream Separator.

The machine does its work well, as is proved by the fact that a chemical test of the skim-milk showed only ·09 per cent. of fat. When tried, it separated three gallons of milk in ten minutes fifteen seconds, the handle being turned at the rate of fifty revolutions per minute, so that it appears to be well up to the capacity claimed for it—viz., sixteen gallons per hour. As this is an empty bowl machine, its performance would seem to throw some doubt on the necessity of the numerous plates to be found in the bowls of many separators. The machine itself is extremely compact and very suitable for a small dairy.

Article 1118.—*Messrs. Robert Boby, Ltd.*, Bury St. Edmunds. Patent Self-cleaning Machine for Separating Rib or Plaintain from Clover. Price 28*l*.—The removal of the seeds of plantain from clover seed has always proved a matter of great difficulty, to overcome which numerous appliances have at various times been made. Messrs. Boby's machine (fig. 2) works on a similar principle to their well-known barley-sorting machine. The seed is fed out of the hopper, by means of a very simple feed-roll, first on to a steel sieve which separates large substances, next

on to an adjustable self-cleaning bed which removes large dock seeds, and necessarily with them a small proportion of large clover seeds; an exhaust fan removes from the clover the docks and other light seeds. The bulk of the clover, with the plantain and small docks, travels on to a second screen, the small plantain and small docks passing through, whilst the medium clover and plantain of the same diameter fall into the indented cylinder beneath.

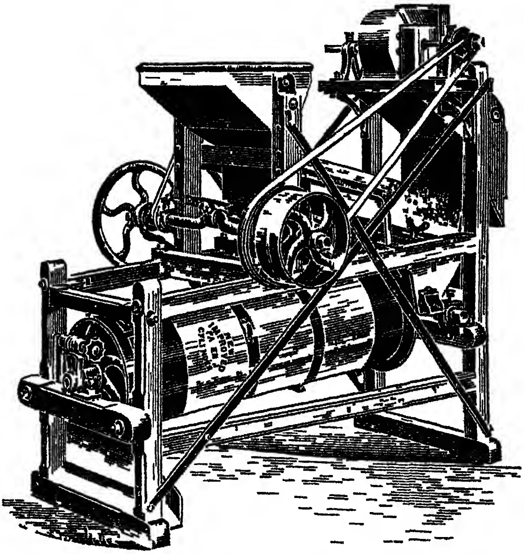


FIG. 2.—Lely's Machine for Separating Rib or Plantain from Clover.

The interior of this cylinder is drilled with a vast number of small cells or indents, directed obliquely to both horizontal and vertical planes; in other words, they are undercut in two directions. These peculiar-shaped cells or indents lift the clover and discharge it into a tray running the whole length of the cylinder, whence it is removed by a screw conveyor. The longer-shaped plantain seeds, on the other hand, fall out of the indents and gravitate down the surface of the cylinder, escaping at holes provided for the purpose at the lower end of it. The inventor claims that other seed besides clover can be efficiently cleaned by this machine. At the Show we tried it on a very foul sample of clover, which it cleaned in the most satisfactory manner.

Article 2503.—*Messrs. J. & H. Keyworth & Co.*, 35 Tarleton Street, Liverpool. Barrow Seed Drill; manufactured for the exhibitors. Price 3*l*. 10*s*., 14 feet; 3*l*. 15*s*., 16 feet.—This is an extremely neat and ingenious little implement. It consists (fig. 3) of a long seed-box mounted on the usual barrow. The box has a thin metal bottom, with holes four inches apart throughout. Beneath the metal bottom is a strip of wood having a groove, in which the vibrating rod or distributor is operated. In the bottom of the groove are holes four inches

apart, placed half way between the holes in the metal bottom above The vibrating rod is made of flat steel, twisted into a spiral. As the seed passes through the holes in the metal bottom into the groove, the spiral vibrating rod carries it along the groove to the holes in the wooden strip beneath, whence it falls on to the ground. From this it will be seen that the usual brushes, which are apt to give so much trouble, are dispensed with. A cam groove on the hub of the wheel operates a lever

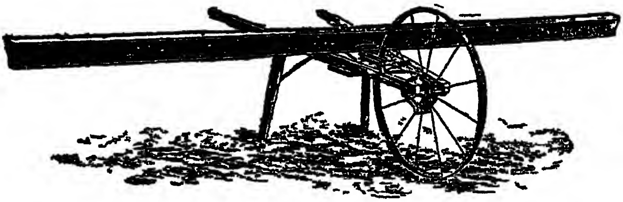


FIG 3 —Keyworth's Barrow Seed Drill

which is connected with the vibrating rod at its opposite end. The fulcrum of this lever can be altered along an index plate by simply slackening and tightening a thumb-nut. When the point is set at its lowest extreme, it will sow two and a half pounds of seed to the acre; when at the other end of the index plate, it will sow forty-six pounds, and it can be set to sow any amounts between these extremes. The box is rather light and weak in its construction, and it is to be hoped that this detail will be improved. As it is made of wood, it can be very easily repaired.

OTHER MISCELLANEOUS EXHIBITS.

I propose to notice a few of these, taking them much in the order of the stands on which they were shown.

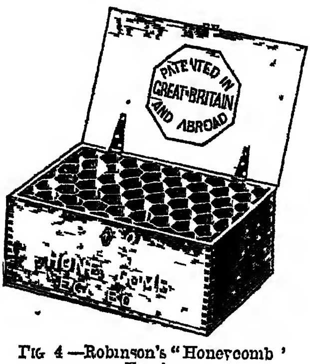


FIG 4 —Robinson's "Honeycomb" Egg box

Article No 201.—*Mr. T. M. Jarman*, Haseley Iron Works, Tetsworth, Oxon. Improved Swath Turner, "The Haseley." Price 14*l.* 14*s* —This implement was also exhibited by Messrs. Ransomes, Sims, & Jefferies, and a short description of it is given on p. 503, under Article 3443.

Article 377.—*Mr. James Robinson*, Honeycomb Box Works, Clitheroe, Lancashire. New patent "Honeycomb" egg-box. Price 10*s*., to hold 12 dozen eggs.—This (fig. 4) is an improved box

for carrying eggs. The novelty consists of making the egg compartment hexagonal, after the manner of a honeycomb, so that the maximum number of eggs can be packed in a box of a given size. As the honeycomb is made of an improved patent leather-board, and there is a layer of felt between each piece of leather-board, it is almost indestructible with fair usage.

Article 837.—*Mr. H. Eckley*, The Stone, Pencombe, Bromyard, showed an extremely neat and ingenious gate-catch, in two forms—one for field gates, and another for small wickets. This catch can be easily fixed to an ordinary gate-post, whether round or square, or made of stone or of wood, without the use of expensive tools. One great advantage it possesses is that, no matter how the head of the gate may drop, the catch will act

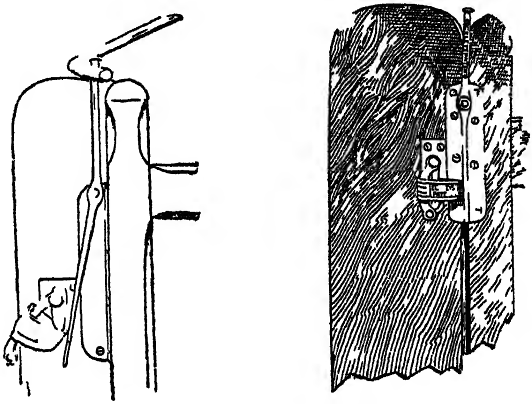


Fig. 5.—Eckley's Gate Catch.

as long as the gate swings to the post. The construction is shown in fig. 5.

Article 1393.—*Messrs. D. M. Osborne & Co.*, Bell Yard, 58 City Road, London, E.C., Spring Tooth Harrow. "Frame of high carbon angle bar; steel teeth bars of tubular high carbon steel, 17 teeth." Price 5*l.* 7*s.* 6*d.*; or if with wheels and seat for driver, 6*l.* 6*s.* By a very ingenious arrangement all the teeth in this machine (fig. 6) can be set at any depth by the movement of a lever. This harrow is very flexible, and well adapted to working over rough ground. As the entire weight of the driver is carried on a sulky arrangement, independently of the harrow, the frame with the teeth is free to rise and fall, so that they will not break should they come in contact with a stone or other resisting object.

Article 1526.—*Messrs. Lankester & Co.*, 71 Southwark Street,

London, S.E. "New Rapid" Grinding Machine. Price 1*l.* 10*s.*—This machine (fig. 7) grinds the teeth of mower-blades at a correct bevel on the sides of two sections at the same

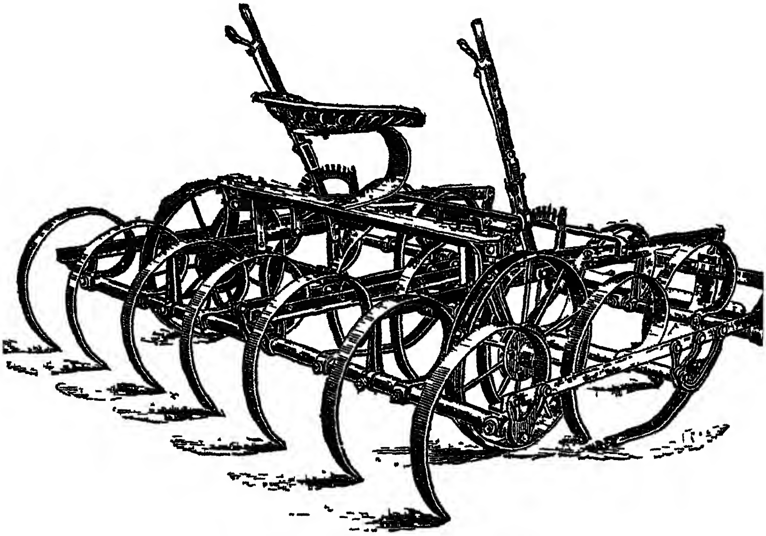


FIG. 6.—Osborne's "Spring Tooth" Harrow.

time. An emery wheel automatically oscillates up and down the knife, and does not round off the points of the sections nor grind away the heel or knife back, as the wheel leaves the knife at both these points. The machine is simple, and there appears to be very little to get out of order. It is portable, and can be taken into the field with the mower, where it should prove a useful labour-saving device.

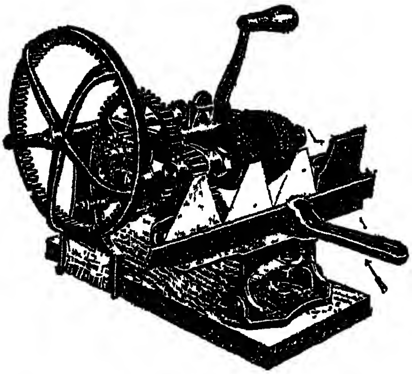


FIG. 7.—Lankester's "New Rapid" Grinding Machine.

Since the Show I have myself tried this machine in practical work in the hay-field, and find it does all that is claimed for it. As it grinds the knives to the correct bevel, they keep sharp longer and cut easier than when sharp-

ened by hand with a file, as in the latter case the natural tendency is to file the edge to too obtuse an angle.

Article 1869.—*Household Supply and Atmospheric Churn Co., Ltd.*, 119 New Bond Street, London, W. Combination Lamp with carbon wick.—The carbon wick gets over the necessity of frequent trimming and cleaning, which causes so much trouble with the ordinary lamp. The same firm exhibited a New Hygienic Vegetable Rack (Article 1861), a very cleanly and convenient receptacle for vegetables and fruits; also a variety of ingenious novelties for domestic use.

Article 1954.—*Aktiebolaget Radiator*, Stockholm, showed through their British agents, Messrs. Berner & Nielsen, 61 Gracechurch Street, London, E C., a new Radiator for hand power.—This is a modification of the radiator shown last year, when it was awarded a Silver Medal (see Journal, vol. viii., 1897, p. 454). The modification consists chiefly in reducing the size of the machine to such an extent that it may be worked by hand instead of by mechanical power, and the delivery of the milk through vertical perforated pipes placed inside the separator bowl, whereby a more even distribution of the milk is obtained, this more even distribution being said to increase the efficiency of the separator. This is also an improvement in the churning bowl, the effect of which is that the butter-milk, which is the result of churning the cream, is picked up by the verticle churning pipe and discharged on to the cream for the purposes of churning it, instead of the cream itself being used for this purpose, as was the case in last year's machine, which caused considerable clogging of the pipe, and a tendency to break the fat globules and thus produce an oily butter. The machine was tried in work, when it skimmed and churned ten gallons of milk in 38½ minutes, leaving only 0 11 of butter-fat in the skim-milk.

Either the pasteurising or ripening process can be adopted with this machine, the former in the ordinary way by a wide range of temperature, and the latter by adding a certain amount of ripened cream to that which is being worked up in the radiator. It is now possible, even in a small dairy, to place upon the breakfast-table butter made from the same morning's milking.

Article 2105.—*Messrs. R. A. Lister & Co., Ltd.*, Dursley, Gloucestershire. "Lister-Stokes" Tester for milk, to test eight samples. Price 5*l*.—This tester shows several improvements on the apparatus of last year. The test-tube is open at both ends, one end being closed with a screw capsule, and the other with a rubber stopper in the usual way, which allows of

the easy cleaning of the tube, and also for a slight alteration of the contained area in case of the formation of gas inside the tube.

Article 2106.—An Automatic Measuring Apparatus for Acids, &c., was shown by the same firm. It is an elaborate instrument, which will no doubt prove a time-saver in a chemical laboratory or a large creamery. An ingenious pipette for automatically taking and measuring the exact quantity of milk to be tested was likewise shown.

Article 2187.—*The Melotte Separator Sales Co*, Counterslip, Bristol. "Melotte" Cream Separator. This, as shown in fig. 8, is designed on somewhat novel lines. Through a mistake, it was unfortunately not entered as a "New Implement" for trial at this year's Show, but the Judges were so struck with the beauty of the arrangement and the extraordinarily small amount of power it takes to drive it that they sent in a recommendation that it should be allowed to enter as a "New Implement" next year. As it will then no doubt be thoroughly tested, it seems unnecessary to give a detailed description of it here. It may suffice to say, therefore, that it separated fifteen gallons of milk in $11\frac{1}{2}$ minutes, while the power taken to turn the handle was surprisingly small.

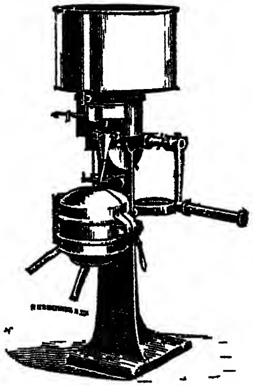


FIG. 8.—The "Melotte" Cream Separator.

Article 2475.—*Messrs. W. Glover & Sons, Ltd.*, Eagle Works, Warwick. Motor Watering Van. Price 400*l*.—This has several points of novelty. It is mounted on a steel frame, and is driven by a Daimler 4-cylinder motor, of 11 b.h.p. The power is transmitted by a shaft running parallel to the motor through a worm wheel mounted on a shaft running at right angles to the motor shaft, and parallel to the axle. Upon the shaft two sets of gearing are fitted—the fast speed, propelling the motor at about six miles per hour, and the slow speed for hill climbing, at about $2\frac{1}{2}$ miles per hour; the axle is fitted with compensating gear for turning corners. The whole of the gearing and change speeds are manipulated by levers fixed within easy reach of the driver. As a special feature the steel frame is bent down on to the axle bearing, upon which the springs are fixed; the body, being carried independently of the frame, the springs are free to move vertically and laterally without in any way changing the position of the gearing. The power is transmitted through spur

and worm gearing, no bevel gearing or chains being used. The front axle is made to compensate for the unevenness of the road without twisting the frame. The body is made so that it can be removed by taking out six bolts, and substituted by any shaped body that may be required: thus the motor-frame and gearing may be made available for other purposes than street watering.

Article 2504.—*Messrs. J. & H. Keyworth & Co.*, 35 Tarleton Street, Liverpool. Two-horse "Adriance Buckeye" Mower, manufactured by Adriance Platt & Co., New York. Price 19*l.*—This (fig. 9) is a mower with roller bearings and an automatic draft spring which is so arranged that any pull in excess of 275 lb. exerted by the horses is transmitted direct to the cutter-bar. The effect of this spring is that it saves the machine from shocks on uneven and rough ground, and in consequence makes the work less trying for horses and reduces the wear and tear of the machine itself.

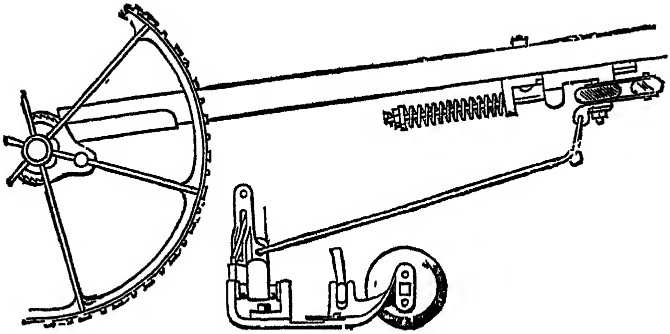


FIG. 9.—The "Adriance Buckeye" Two-horse Mower.

Article 3117.—*Messrs. Thompson & Southwick, Ltd.*, The Foundry, Tamworth, Staffs. Cart fitted with Southwick's Patent Iron Wheels. It is claimed that these wheels, which are made entirely of iron and steel, are unaffected by heat or moisture, weather or climate, and that they are much more durable than wood; also that they are lighter and easier in running. It seems probable that these claims will be proved to be well founded in practice. The design is such that there appears to be little risk of deterioration.

Article 3442.—*Messrs. Ransomes, Sims, & Jefferies*, Ipswich. New patent double-row Potato-planter. Price 20*l.*—This (fig. 10) is an improvement on the double-row potato-planter which gained first and second prizes at a trial of these implements in April 1896 (see Journal, vol. vii., 1896, p. 231). The improve-

ment consists in a finger-and-thumb arrangement (fig. 11) which picks up each potato, in substitution for the needles which in

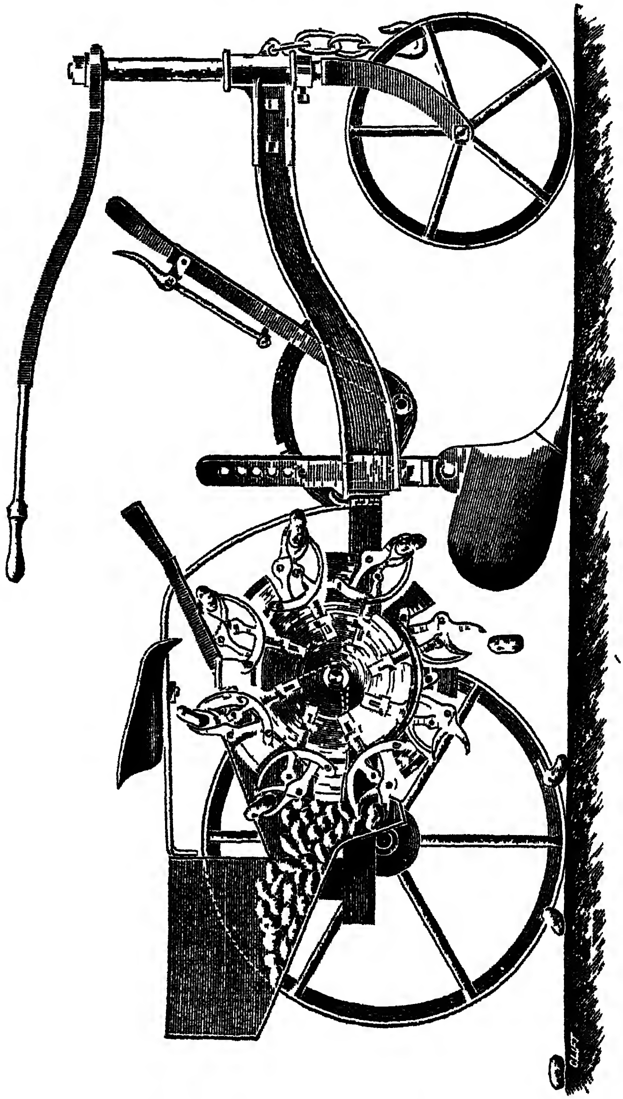


FIG 10 —Ransome's Double Row Potato planter

the prize machine pierced the potatoes, and were liable to be damaged if they came in contact with a stone. With the new finger-and-thumb arrangement, should there be any stones with

the potatoes, they are picked up and placed in the row in exactly the same way as are the tubers, and no damage is done.

Article 3441.—Messrs Ransomes & Co. also showed a Plough for renovating pastures. Price 6*l.* 6*s*—This (fig. 12), as far as I am aware, is quite a new departure. To what extent it will fulfil the objects for which it is made remains to be proved. This plough cuts the turf to a thickness of two or three inches, lifts it, and deposits it again in the same place, tines or scarifiers simultaneously acting on the ground beneath; and it is claimed that this action cuts the roots of weeds, aerates the soil, and encourages the growth of the grasses. The plough is so arranged that artificial manure may be introduced under the soil if thought desirable. This treatment of pasture is so new that it is impossible to form an opinion as to its merits, but I propose myself to give it a private trial this autumn, with a view of ascertaining what the effects are.

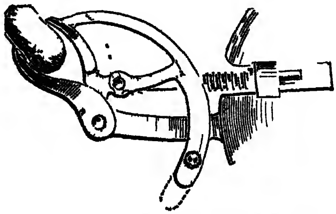


FIG 11—Finger and thumb Arrangement in Ransome's Potato planter

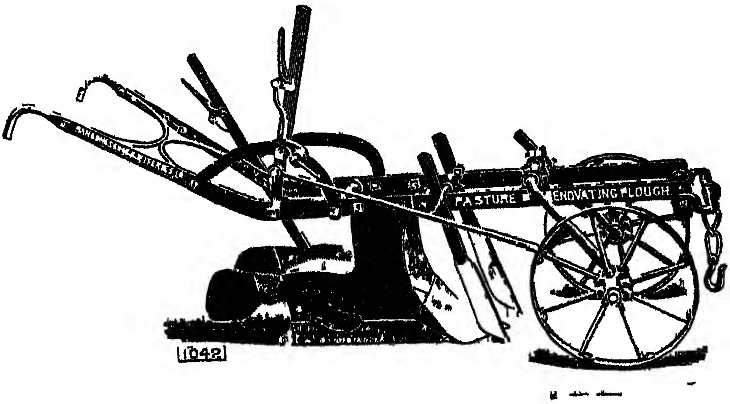


FIG 12—Ransome's Pasture Plough.

Article 3143.—The same firm showed Jarmain's Patent Swath Turner, also exhibited by Mr. Jarmain himself on his own stand as mentioned at p 496. This machine was awarded a Silver Medal in 1896 (see Journal, vol. vii., 1896, p. 446), but it has since been fitted with several improvements, the chief of which are that the fliers are now placed one in advance of the other, so as

not to interfere with each other in working. The fliers are fitted with spring hinges in order to allow them to give way on coming in contact with any obstruction; they are also fitted with a feathering arrangement, which gives them a long sweeping motion on the ground.

Article 3481 —*Messrs. James & Frederick Howard*, Britannia Iron Works, Bedford. Press for hay and straw, with a new

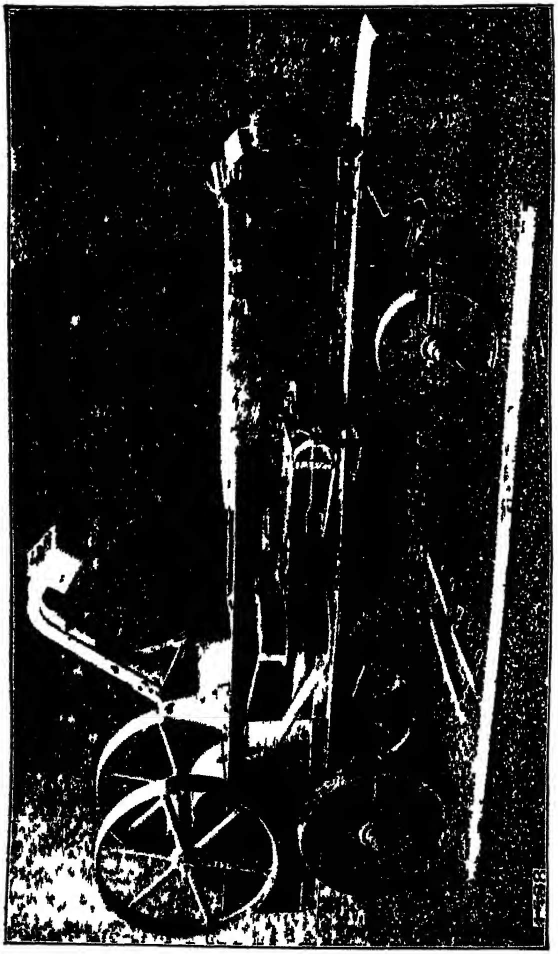


FIG. 13.—Howard's Hay and Straw Press.

patent automatic wiring device. Price 150*l*.—This (fig. 13) is a large machine capable of taking the straw direct from the threshing-machine. The press is fitted with the Howard patent self-

feeding device, and new automatic wiring device, thus dispensing with the necessity for division boards. The wire is wound on two bobbins, and two long needles thrust a loop of wire across the press at the will of the attendant. As soon as a bale is formed, the wires are cut and the ends are twisted together by the attendant, and the complete bale is discharged from the machine ready for transport.

Article 3482.—Messrs. Howard also exhibited the Leeming-Smith Patent Hydraulic Press for hay and straw, to be worked by hand power; price 25*l.* to 30*l.* This is an extremely convenient and portable machine, and has the advantage that the straw is packed in its full length and not bent or broken, and is therefore more durable when used for litter, &c.

Article 3517.—*Messrs. Sargeant & Co., Ltd.*, Cattle Market Road, Northampton. The "Revolution" Manure Distributor. Price 20*l.*—This

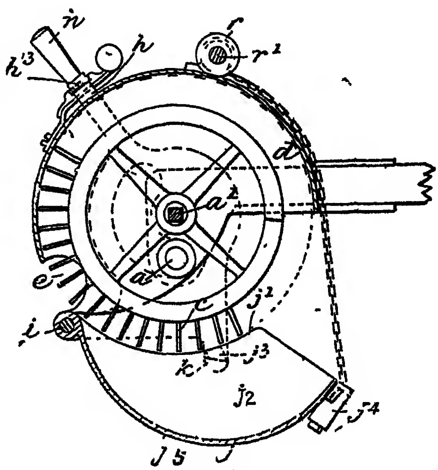


Fig. 14.

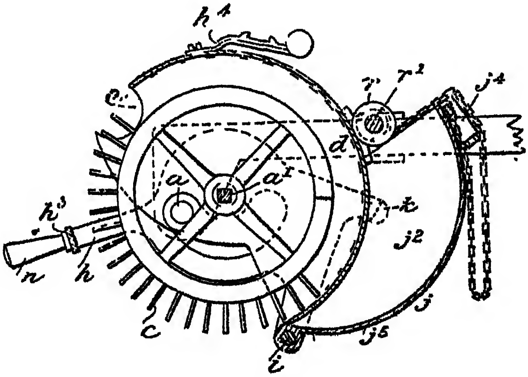


Fig. 15.
Sargeant's Manure Distributor.

machine has a novel arrangement for filling the hopper and so arranging the contents that the feed shall be regular from the

commencement of the work. Referring to figures 14 and 15, the working parts consist of the cylindrical shield *d*, the spreader *c*, and the hopper *j*, and suitable mechanism, for raising and lowering the same, not shown in the figures. The spreader *c* is driven by gearing through shaft *a*, from the carrying wheels of the machine. The shield *d* is a cylinder from which a part has been cut away, equal to the space taken by the opening *e*, and bottom of hopper *j*. The shield can be rotated on centre *a*, from its position in fig. 14 to that shown in fig. 15. The hopper *j* is composed of a plate bent to form a segment of the circle of the shield *d*, and its two ends are also made to correspond at their edges with the curve of the shield *d*. The hopper is pivoted upon a rod *i*, and is supported at its front end by two chains *j*4, by which it is gradually fed up to the spreader. Fig. 15 represents the machine ready for filling, the hopper *j* being raised to the position shown, and it will be seen that the manure must take the curve of the shield *d*. After filling, the hopper is lowered to the position shown in fig. 14, so that the manure presents a surface to be acted on by the teeth of the spreader, which corresponds with the path described by them, the result being that the machine delivers evenly from first start. As the machine proceeds, the hopper *j* is gradually raised so as constantly to present fresh manure to the spreader teeth. The rate at which it is raised can be arranged according to the quantity of manure to the acre it is desired to distribute. There is an automatic safety trip fitted which prevents the over-winding of the hopper.

Articles 3579 to 3597.—*Messrs. Thomas Robinson & Son, Ltd.*, Rochdale, exhibited a variety of Milling Machinery, which showed the great advance that has of late years been made in this branch of engineering. An inspection of their stand, with its magnificent exhibit of machinery for treating wheat from the time it leaves the threshing-machine till it is ground and sorted into the numerous grades of flour and other products with which we are all familiar, was in itself no small educational treat. The size and completeness of this exhibit render it futile to attempt to describe the several machines in detail within the space at my disposal.

Article 3619.—*Messrs. Robinson & Auden, Ltd.*, Vale of White Horse Iron Works, Wantage, Berks. Vertical High Speed Steam Engine, fitted with Robinson's Patent Perfected Silent, Adjustable, Shaft Governor. Price 67*l.*—By an ingenious system of cords, springs, and pulleys, Mr. Robinson has been able to dispense with the heavy weights that have hitherto been almost universally used in this class of governor. As far as could be judged on the ground, it seemed

to give perfect control under various conditions. All the working parts being so light, the wear and tear is reduced to a minimum.

Article 3818.—*Messrs. W. N. Nicholson & Sons, Ltd.*, Trent Iron Works, Newark-on-Trent. "Hercules" Cultivator. Price 9*l*. 10*s*.—This is a very flexible machine (fig. 16), and is well adapted to uneven ground. The frame carrying the tines is

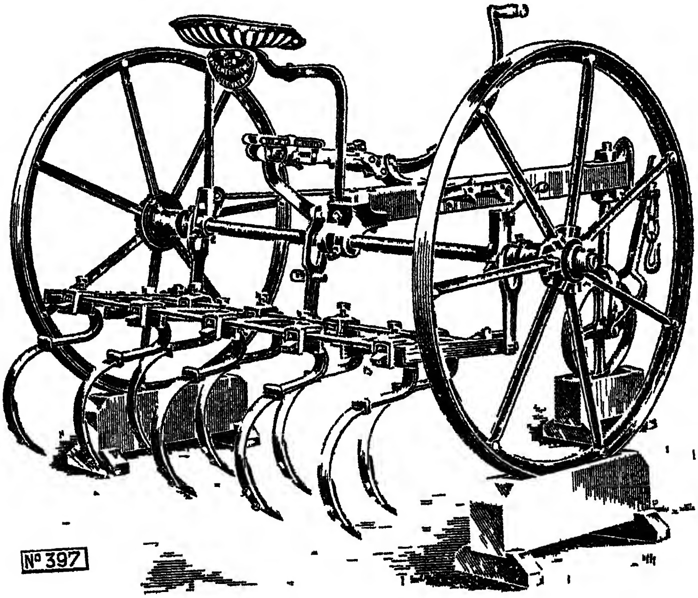


FIG. 16.—Nicholsons' "Hercules" Cultivator.

hung from the axle by brackets, in which are slots so arranged as to allow it sufficient play to let the tines follow the irregularities of the ground.

Article 3869.—*Messrs. Lee, Howl, & Co., Ltd.*, Tipton Engineering Works, Tipton, Staffs. Steam Pump of the "Tipton" compound direct-acting ram type. Price 89*l*. 10*s*.—This has a compound engine with steam-moved slide valve. The action is beautifully quiet and regular under varying speeds and loads, and appears admirably adapted for lifting large quantities of water against a heavy head, but the machine will probably find its greatest usefulness in mining rather than in agricultural work.

Article 4166.—*Messrs. Rushworth Bros.*, Primet Bridge Foundry, Colne, Lancashire. Frame Stone, Marble and Granite Cutting Machine. Price 295*l*.—This is a powerful

machine, and was shown in operation on huge blocks of various material, such as marble, slate, Portland stone, Yorkshire stone, &c., working both with sand and crushite, and was doing the work in a most satisfactory manner both as to speed and finish of cut.

Article 4607.—*Messrs. R. & J. Reeves & Son*, Bratton Iron Works, Westbury, Wilts. The "Advance" Elevator or Stacker. Price 40*l*.—This is an elevator of a new design, constructed of steel and corrugated galvanised iron. It is fitted with an ingenious arrangement whereby the chains carrying the elevator prongs are slackened as soon as folding commences, thus doing away with the necessity of having the chains slack, as was the case in the old pattern. The raising and folding gear are fitted with automatic stops, which make it impossible to overwind in folding, unfolding, or elevating the troughs.

Perhaps one of the most interesting and significant stands was that of the Warwickshire County Council, showing the produce from their Educational Dairy Farm School at Houghton Grange, consisting of cheese, butter, eggs, poultry, honey, &c. Amongst the cheese exhibited I noticed the following varieties: Coulommier, Pont l'Evêque, Gervais, Cream, Camembert, Wensleydale, Cheddar, Stilton, Cheshire. The farm consists of 200 acres, of which 70 are arable. Dairying is exclusively carried on, and there is accommodation for eleven pupils. It is satisfactory to know that the advantages held out by this school are now being appreciated by young men who intend to make farming their business, and it will doubtless have the effect of raising the quality of the dairy produce of the ordinary English farm, an improvement for which, it is to be feared, there is at present ample room.

I cannot conclude this short report without expressing the thanks of my colleague, Mr. Hippesley, and myself to the Exhibitors for the invariable courtesy with which they received us, and to the Stewards of Implements, who did everything possible to assist us and make our work easy and pleasant. To Mr Courtney, the Consulting Engineer to the Society, our thanks are also due for having devoted so much of his time to helping us, an assistance the value of which we cannot over-estimate.

R. M. Greaves.

Wern, Portmadoc, North Wales.

THE TRIALS OF METHODS OF SAFE-GUARDING CHAFF-CUTTERS.

THIS competition was instituted by the Society in consequence of the passing, in the 1897 session of Parliament, of the Chaff-Cutting Machines (Accidents) Act, which came into force on August 1, 1898. It enacts that the feeding-mouth of the box of every chaff-cutting machine that is worked by any motive power, other than manual, shall, so far as is reasonably practical and consistent with the due and efficient working of the machine, be of such construction, or fitted with such apparatus or contrivance, as to prevent the hand or arm of the person feeding the machine from being drawn between the rollers to the knives; and that the fly-wheel and knives of every such machine shall, so far as is reasonably practical and consistent with the due and efficient working of the machine, be kept sufficiently and securely fenced during the working thereof, and anyone not complying with the Act is liable to a heavy penalty. The Society offered a prize of 10*l.* for the "Best Method of Safe-guarding Chaff-cutters, to comply with the Chaff-Cutting Machines (Accidents) Act, 1897."[1]

The trials took place in the Showyard at Four Oaks Park on Friday, June 17, 1898, when the following firms put in an appearance:—

Mr. R. H. LANE, Fairview, Cheltenham.
Messrs. J. BRODIE & J. D. MIDDLETON, Gee Cross, near Manchester.
Mr. THOMAS CORBETT, Shrewsbury.
Messrs. DENING & Co., Chard, Somerset.
Messrs POWELL BROS. & WHITAKER, Wrexham.
Messrs. JOHN CROWLEY & Co., LTD., Sheffield.
Messrs. MARSHALL, SONS & Co., LTD., Gainsborough.
Messrs. RICHMOND & CHANDLER, LTD., Manchester.
Messrs. G. H. INNES & Co., Hitchin
Messrs. E. H. BENTALL & Co, Heybridge, Maldon.
Messrs. WOODROFFE & Co., Rugeley, Staffs.
Messrs. KELSEY & Co., Guernsey Road, Sheffield.
Messrs. CARSON & TOONE, Warminster.

Each of the above competitors exhibited one appliance, except Messrs. Richmond & Chandler, who sent two appliances, and Messrs. Bentall & Co., who sent three.

All the machines were carefully examined and tried in work with wheat-straw, oat-straw, and hay.

As this competition was originated simply with a view of ascertaining the best safety appliance, no note was taken of the

[1] For the precise terms of the Act, see Journal R A.S.E., vol. viii. 1897, p. 551.

efficiency of the machines as to rate or quality of work, and it had of course to be borne in mind that the safety appliance should be capable of being easily and cheaply adapted to any machine in the market, and should be equally applicable to large or small machines, so as to put the owners of such machines to as little expense as possible in complying with the Act.

The majority of the machines were provided with the well-known cross-bar and clutch arrangement, the general idea of which is that in the event of the attendant's hand being drawn between the rollers the forward movement of his arms and body will bring him in contact with the cross-bar, and thus stop and reverse the motion of the rollers. But it is doubtful whether a man, finding himself in such a predicament, would have the presence of mind to bring any part of his body in contact with the cross-bar, the natural tendency being to endeavour to withdraw the hands by throwing the body back and pulling straight from the shoulder, thus delaying the operation of the cross-bar until too late.

Other machines were fitted with live chains or rollers—*i.e.* chains or rollers driven by gearing, which, automatically compressed and fed, press onward the material to be cut, thus avoiding the necessity of the attendant placing his hands so far forward as to be drawn between the feed rollers. In the case of these machines, however, it is doubtful whether it would at all times be easy for the attendant to withdraw his hands without injury, in the event of their being drawn under the live rollers.

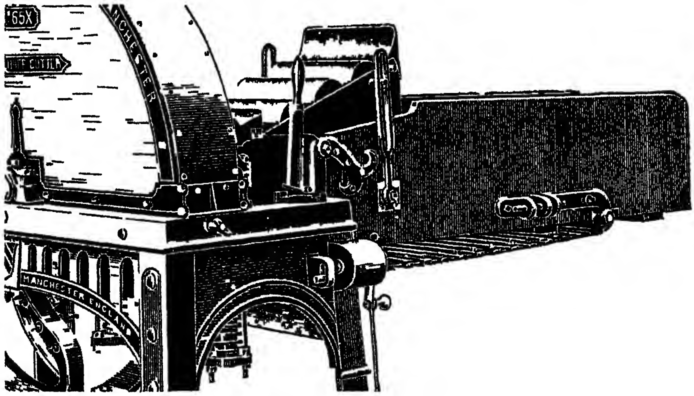
Other machines were fitted with idle rollers, *i.e.* rollers free to revolve with the passage of the material to be cut beneath them, these rollers compressing the material before it reached the feed rollers, the travelling web being relied on to give the necessary forward motion to the hay or straw. It is to this class that Messrs. Richmond & Chandler's machine (Article 3219), to which the prize of 10*l.* was awarded, belongs.

The safety appliance consists of a train of four idle presser rollers fixed in a frame behind the upper feed roller frame, with which it is free to rise and fall, the back end of the frame being also free to rise and fall with the increase or decrease of the amount of the material passing beneath. The first presser roller being 25 inches from the feed rollers, it is practically impossible for the attendant to get his hands caught between the latter, and the four rollers being idle—*i.e.* not driven—renders it easy for him to withdraw his hands from any point under them. The presser rollers are placed sufficiently close together to prevent the possibility of the attendant's hands being inserted between

them, neither is there room for the attendant to place his hand between the last roller and the upper feed roller.

This appliance seems to secure absolute safety, for the first roller being 25 inches from the feed rollers, it is impossible for the longest armed of men to reach the feed rollers with his hands. All the moving parts are well cased in, and the requirements of the Act are fully met. The frame carrying the four compressor rollers can be readily fitted to existing machines of any make at an estimated cost of 3*l.* 5*s.* for a 12-inch machine.

Messrs. John Crowley & Co., Ltd., Sheffield, exhibited a machine (Article 2816) with a safety arrangement of the cross-bar type, the bar in this case being 19 inches from the feed rollers, and the distance rendering it very improbable that the



Richmond & Chandler's Prize Chaff-cutter.

attendant's hands would be drawn to the feed rollers. It is a simple mechanical appliance, and it is claimed that it can be fitted to any existing machine for the small sum of 2*l.* 5*s.* for a 12-inch machine.

Mr. Thomas Corbett, Shrewsbury, exhibited one of his wrought-iron girder machines (Article 2267) fitted with a safety appliance of the cross-bar type; but the cross-bar is made adjustable and removable. It is not easy to see the advantage of having the cross-bar adjustable, and it is certainly a disadvantage to have it removable, as there is the risk of its being removed and lost by a careless attendant, in which case the owner would be liable to penalties for his machine not complying with the Act.

Messrs. G. H. Innes & Co., Hitchin, exhibited a large machine (Article 3268) with a live chain or web fitted so as

to gradually compress the feed, somewhat in the same manner as Messrs. Richmond & Chandler's rollers do, with the difference that the chain or web is driven by the machine, and is not merely free to move under the action of the feed.

Many of the machines showed that much thought and care had been expended in an effort to comply with the Act, while in others there was little or no alteration from the existing practice. In some instances the casing of the gear-wheels was too flimsy, being constructed of thin sheet-iron, which would be very liable to become distorted in use.

The Society is to be congratulated on the result of the trials. It shows not only that a practical safety appliance need not add greatly to the cost of a chaff-cutter, but also that owners of existing machines can have them altered to comply with the Act at a comparatively small cost. It is to be hoped, therefore, that we have heard the last of the terrible accidents that have heretofore occurred with machines of this kind.

R. M. GREAVES.

Wern, Portmadoc, North Wales.

FLOWER AND FRUIT FARMING IN ENGLAND.

II.

THE article in the preceding number of the Journal (this vol., p. 286), except for some general remarks, carried the investigation of the comprehensive subject upon which I have undertaken to report no further than flower-growing in the Scilly Isles and Lincolnshire and Wisbech bulb farms. Most of the available space was devoted to an account of the growth of the narcissus in its multiform varieties; and yet I had not by any means covered all the important sources of its production, for I found the beautiful flower very strikingly in evidence in suburban market gardens, and in a few other and widely-separated parts of England. It would not be compatible with the plan of this report to follow the cultivation of bulbous flowers consecutively throughout the country; but in treating what, in a wide sense of the term, may be styled Metropolitan flower-growing, I shall commence with the Thames Valley, the chief district near London in which flowers of this class are grown.

Flower-Growing around London.

A. In the Open.

Taking a radius of twenty miles from Charing Cross, the sources of a surprisingly large proportion of the flower production of the country are found to be covered: and if, in a few directions, the survey be extended to twenty-five miles, there are left scarcely any great producing districts to class under flower-growing in the provinces, other than those noticed in my first article. The statement applies not only to the flower supply of London, immense though that is, but also to the supply of most of the other great markets of the country. In visiting market-garden districts near to London, I was struck first with the extent to which culinary vegetables had been driven further afield to give place to fruit, and secondly with the more recent and smaller, but still considerable, displacement of fruit by flowers.

There is some inconvenience in dealing with the cultivation of flowers in the open and under glass separately, because, as many growers carry on both branches of the industry, while some grow fruit also, a strict adherence to the division would involve the necessity of describing the produce of the same grower in two or three parts of my report. To avoid this repetition as far as possible, the placing of a producer in one or other of my divisions will be determined by the preponderance of his production, except where it is extensive in two or more divisions, and the comparatively insignificant branch of his enterprise will be noticed briefly and incidentally.

It seems desirable to repeat in substance some remarks made in my first article in relation to the selection of representative flower growers, both in the open and under glass, for visits. Of course, only a few out of a great number could be visited, and while the best available advice was taken as to extensive growers of different classes of flowers, a selection from among those named had to be made, and that selection depended partly upon convenience of access, or nearness to other growers whom it was desirable to see. This explains in part how it happened that many of the most notable flower growers were not visited. Again, some of the most famous growers of roses or other flowers, whose names are familiar to all visitors to flower shows, were not embraced in my itinerary, because, although many of them sell cut flowers in the markets, they are mainly producers of plants or shrubs for flower growers, and, as in the case of the great seed firms, they could not be included in my plan of

investigation without enlarging my report to a very great extent. Together with the great seedsmen and the fruit tree and bush nurserymen, they must be credited with a large share of the improvement which has taken place in so striking a degree in the industries covered by my report, and this fact has been so frequently brought home to me in relation to what I have seen and heard during my visits to market growers that I have repeatedly regretted the necessity, for the present at any rate, of leaving their remarkable and beneficial enterprise outside the scope of my investigations.

Mr. James Walker, of Ham Common, near Richmond, was recommended to me by so many authorities as a leading grower of flowers and fruit that my first visit to an open-air Metropolitan flower farm was made to that which he occupies. The holding consists of 120 acres of sandy soil, and was taken on lease as an ordinary farm from the Earl of Dysart, and planted with flowers and fruit by Mr. Walker. The fruit will be referred to hereafter, and it is noticed incidentally in this place because most of the flowers are grown between the fruit trees. Mr. Walker is one of the best growers of narcissi, including daffodils, and it is worth while to mention that he was the first grower to send these beautiful flowers to market in the pyramid-shaped bunches now universal, as so much more attractive than the old form of bunch, in which the blossoms were huddled together in rose shape. As Mr. Walker has grown the narcissus for many years, I asked him a question as to the time when bulb-growing for market came into operation, and his reply confirmed the evidence as to the recent establishment of the industry obtained in the Scilly Isles and in Lincolnshire. Twenty-two years ago, when he came from Scotland to England, Mr. Walker believes, no nurseryman bought English bulbs.

Mr. Walker grows twelve acres of narcissi, mostly in his fruit plantation, but partly in open ground. He grows these flowers, moreover, remarkably well. Nothing superior to the splendid lots of Emperor, Empress, Horsefieldi, Sir Watkin, and Campernelli, which were ready for market on the day of my visit, April 8, had been seen by me, or was afterwards seen elsewhere. The picking of Emperor had just begun, and this fact is worth notice for the purpose of comparing the date with that of the gathering of the same variety in the Scilly Isles, a month earlier. Ornatus was not in bloom, whereas it had begun to come out in the Scilly Isles on the 14th of March. The fineness of the blossoms was partly explained by the fact that Mr. Walker allows his bulbs to stand only two years, and then grows them on fresh ground, after some other crop. They have plenty of

room, too, as most varieties are planted 12 in. by 3 in. apart, and two years are not long enough to allow of their thickening greatly. Mr. Walker grows bulbous flowers chiefly, as he does not believe that anyone who goes in for a multitude of varieties makes them pay. The tulip, iris, lily of the valley, Lilium candidum, gladiolus, pyrethrum, and pæony are the principal flowers, besides the narcissus, grown at Ham Common, some of them in great variety. With respect to the pæonies, many strains of which are produced, they occupy the same ground for a long time, but degenerate after six or seven years, if not shifted. Some narcissi and large lilies are taken into the hot-houses in the autumn and forced for sale early in the season. Cyclamens for sale in pots and chrysanthemums for cutting are also produced under glass. In reply to a question as to the fall in the prices of flowers, Mr. Walker said that it had been great in recent years. Still, he was not prepared to say that the flower-growing industry was overdone, though it soon might be if greatly extended.

Another very large grower of bulbous and other flowers is Mr. Aldridge, of Petersham, a short distance from Ham Common. He occupies about seventy acres of land, sixteen to eighteen acres being devoted to fruit, about four acres to asparagus, and the rest to flowers. Mr. Aldridge grows ten to twelve acres of narcissi, and he had an immense quantity of lovely flowers ready for market on April 8. He begins the cut flower season in the second or third week in January with forced narcissi, such as Princeps, Cynosure, Ornatus, and a few double daffodils. The doubles, however, do not flourish in the district, and have to be purchased for forcing. This statement led to a question as to the possibility of growing the polyanthus varieties, which are produced for market almost exclusively in the Scilly Isles. Mr. Aldridge has not attempted to grow them, though he thinks he could. Outdoor narcissi begin to be picked about the middle of March, Campernelli and Sir Watkin being first. The start was made on March 22 this year, and on March 15 in 1897. Sir Watkin is closely followed by the single Incomparabilis varieties, and then Empress, Horsefieldi, and Emperor are gathered in great bulk in April, Ornatus and Barri Conspicuus following in large quantities, with smaller quantities of other varieties; while the narcissus trade winds up with the disposal of Bicolor Grandis and the old Pheasant Eye. Hardy herbaceous plants follow the narcissi. Iris Germanica, in variety and large quantity, is ready early in May, and Doronicum excelsum also comes in with a supply of yellow flowers at a time when they are wanted, other yellows being short. Next pyrethrums in their beautiful variety

are gathered from eight to ten acres; also pæonies in charming colours. The pyrethiums are over in the latter part of June, when Iceland and other poppies fill the gap. Marguerites in three varieties follow, with stocks, erigerons, and other flowers in July. Echinopsis comes on in August, and asters are ready in the latter part of the month and in September, while Michaelmas daisies and a few chrysanthemums finish the open-air flower season at Petersham. In the hot-houses used for forcing flowers a few tomatoes are afterwards grown before the chrysanthemums and narcissi are brought into them in the autumn.

With the objects of obtaining information as to the rise of the bulb-growing industry, described in my first article, and of seeing some of the choicest new varieties, a visit was made to Messrs. Barr & Sons' flower grounds at Long Ditton on April 21. At that time Glory of Leiden, Madame Plemp, and Madame de Graaf were in their full beauty, with Incomparabilis Beauty, the bright golden Queen of Spain, Mrs. Langtry, the Golden Spur, the delicate Angels' Tears, and other charming varieties. Bulbs are grown for sale as bulbs; but a considerable crop of flowers is marketed. For an unnamed seedling, believed to be the largest variety in existence, fifty guineas (for the single bulb) had been refused on the day before my visit; but a second unnamed seedling, not quite as fine, commended itself to me as more symmetrical. Quite as striking, too, were the New Monarch, like an extra large and deeply-tinted Emperor; Weardale Perfection, resembling a gigantic Empress, and bigger than even Glory of Leiden; and Lady Helen Vincent, another fine new variety. Messrs. Barr hybridise tulips, as well as narcissi, and some very gorgeous new sorts were in bloom. They grow also irises, chrysanthemums, violets, and other hardy flowers; but my attention was almost exclusively directed to the narcissi, for which the nursery is famous. In raising new varieties, after the seed is sown the resulting bulbs are left two or three years, and are then transplanted, and left two years again Usually large sorts are six years from the sowing of the seed to the first flowering, while a few small varieties bloom in two to four years after the sowing. Forced varieties in this nursery are ready early in January, and the first open-air flowers early in February, beginning with N. minimus. It was interesting to learn that when Mr. Peter Barr came to London, in 1860, there was no covered flower market at Covent Garden, flowers being sold on carts and barrows in the streets. The trade was then very small, consisting chiefly of pot plants, with only a few cut flowers.

In travelling to Twickenham, which is the centre of a great

market garden district, fruit plantations, with flowers among some of them, are encountered as soon as Putney has been passed, becoming more common as Barnes, Mortlake, and Richmond are successively traversed. At Twickenham my visit was made to Mr. W. Poupart, an extensive producer of flowers, fruit, and vegetables, who will be referred to chiefly in the fruit section of this report. The soil at Twickenham is a good and deep loam over the gravel, well suited to flowers or fruit. Mr. Poupart, whose holding extends to about 160 acres, grows from 8 to 10 acres of narcissi, partly under fruit trees, and partly in the open ground, producing some very fine flowers; also over an acre of pæonies, and moderate quantities of tulips and wallflowers. He produces lilies of the valley extensively outdoors, simply placing flat glass lights over them to keep them clean and draw them up a little. So grown, they are ready for cutting early in May. Doronicums and various bedding plants are also grown, with a few roses and chrysanthemums. Mr. Poupart has not much glass; but he forces some narcissi, and uses his houses for chrysanthemums in the autumn.

Other market gardeners in Twickenham and the adjoining parish of Isleworth grow wallflowers in their fruit plantations, and some cultivate narcissi and other flowers, Mr. Hawkins, of Twickenham, being a great producer of lilies of the valley, and Mr. Tibbet, of Isleworth, of asters. The seed of wallflowers is sown early in March, and the plants are set out in the autumn for blooming in the following spring. Asters are grown in large quantity by at least one market gardener at Isleworth.

Passing on to Feltham, I found wallflowers and narcissi extensively growing in fruit plantations. Mr. Baker, of Feltham, grows wallflowers on a large scale, but does not appear to be satisfied with the industry, as he complained of the price at 1*s.* per dozen bunches. At one time, he said, he was the most extensive grower of violets in the country, whereas now he grows none. Supplies from the south of France, he explained, "knocked me right out of the trade." Foreign flowers in his time, he believes, have increased a hundredfold in our markets. Now he devotes his attention mainly to fruit. What Mr. Baker said about English violets being driven out of the market by the French supply was afterwards confirmed by other authorities. One who formerly grew a very large quantity said he had entirely ceased to produce them for the winter and spring, because the French violets were so much finer than English that buyers would not look at the latter when the

former were in good supply, and very cheap, as they usually are. He grows violets still, but so manages them that they flower in October and November, when no foreign violets are in the market. I was informed, however, that these flowers are largely grown by Mr. Barnfield, of Bedfont, who, indeed, was described as the most extensive cultivator of violets in the country.

In one nursery at Feltham I noticed polyanthuses and primroses in cultivation, but not upon a very large scale. Wallflowers and narcissi appear to be the flowers most extensively grown in the parish, as well as in Bedfont, where Mr. Barnfield, who occupies a large acreage of market garden land, was mentioned as one of the largest producers of wallflowers in England.

Pursuing my route from the great market garden districts south-west of London (some of which, not named above, will be mentioned in connection with the hothouse industry, and others in relation to fruit) I left the daffodil region almost entirely behind me. It is true that some were found at Whitton and, still further northward, at Cranford; but there were only a few small patches. It became apparent that I was getting more into the rose country, and into a district of more multiform flower-growing than I had visited after leaving Petersham. It was at Hounslow that roses were first noticed in a fruit plantation, a striking example of the displacement of bush fruit by flowers. At Whitton outdoor roses and daffodils were found growing in alternate rows, in a nursery which will be noticed in the hothouse division of my subject; and in another, which was not visited, cyclamens and roses are grown to a considerable extent.

It was through the kindness of Mr. George Taylor, of Cranford, a well-known breeder of dairy Shorthorns, that I enjoyed the pleasure of inspecting some flower grounds in his parish. The first visit was made to Mr. Shawyer, who holds a very neat little flower farm of 20 acres, including two small cherry orchards. The soil is a loam on a thin layer of clay, with gravel below. Mr. Shawyer cultivates a great variety of flowers, including the rose, pansy, iris, pyrethrum, pink, poppy, marguerite, cornflower, gladiolus, chrysanthemum, sweet sultan, aster, and mignonette. The variety makes a considerable and a somewhat arduous business on a small area, and the disposal of the flowers, mainly to West-end florists direct, increases the detail. But Mr. Shawyer is helped greatly by his sons and daughters, who lighten his labour bill. The price and rent of land in the parish, which is quite out of the route of suburban dwellings, are unaccountably high, and labour is dear.

Mr. Evans, in the same parish, occupies 30 acres of land, on which he grows fruit and flowers, the latter including daffodils, tulips, anemones, pansies, forget-me-nots, and a considerable quantity of violets. But he is more a fruit-grower than a flower-grower.

Mr. Neighbour, of Cranford, has 15 acres of fruit and flowers, and, I believe, another holding in an adjoining parish. Roses were blooming profusely in a fruit plantation many acres in extent. More healthy and vigorous roses I have never seen, and it was a surprise to see them doing so well under fruit trees. The varieties are chiefly General Jacqueminot, Duke of Edinburgh, and La France. Narcissi, sweet williams, wallflowers, forget-me-nots, irises, and large lilies are also grown in the fruit plantations. In the open ground acres of pinks and carnations, and large quantities of pansies, pyrethrums, cornflowers, anemones, and other flowers, are cultivated. Mr. Neighbour's produce goes to Covent Garden, which is about twelve miles distant by road.

In the course of a drive through the great fruit-growing district of Harlington and Sipson, flowers were occasionally noticed under fruit trees, though not in the great majority of plantations. This was the limit of my route from districts lying south-west of London towards the west and northward. There is some similar cultivation around Ealing, but very little in the north-western side of London until Finchley is reached, and there the floral industry is mainly a hothouse one, to be noticed hereafter.

To the east of the great market garden districts in the Thames Valley, and due south of Charing Cross, a comparatively isolated but very important tract of country, largely devoted to the production of flowers, culinary vegetables, and salad plants, is found. The greater portion of it is contained in the parish of Mitcham, though there are out-lying portions in adjoining parishes. Mitcham was once famous as a great lavender district; but the cultivation of that shrub has died out in the parish, on account of the crop having become unhealthy through its cultivation on the same land for a long period. Possibly it would not have been beyond the resources of science to prescribe a course of treatment which would have restored the suitability of the land for lavender; but it does not follow that such procedure would have been profitable. At any rate, the lavender-growing industry has been removed to land less valuable for the cultivation of flowers and vegetables, as, for example, to the Carshalton district near by, and again to Hitchin and some parts of Bedfordshire; also to Elsenham, in Essex, where Sir Walter Gilbey

grows some acres of lavender. The Provence rose, too, was once grown extensively in Mitcham for scent-making; but, although there is still a scent factory in the place, this flower, like lavender, has gone out of cultivation, with camomile and peppermint, for which the parish was once noted.

Mitcham now, however, can claim the largest mixed flower farm supplying the Metropolis, and probably the most extensive in the kingdom. Messrs. Mizen Brothers occupy 80 acres, almost entirely covered with flowers and glass-houses. Their father came to Mitcham 31 years ago, and established a great vegetable farm. He now occupies 250 acres, growing culinary vegetables and salad on a very extensive scale; also tomatoes and cucumbers in glass-houses. He or his sons, or both, are great producers of mushrooms, both outdoors and in forcing-houses. It is his sons, however, who have developed the flower industry, and it was Mr. Alfred Mizen who showed me the interesting farm and the great extent of hot-houses, and afforded me information respecting the products. The top soil of the farm is a loam of fair depth, partly on the London Clay, and partly on gravel. The open-air flowers for cutting most extensively grown are chrysanthemums, of which there are 15 to 20 acres, varying with the season (both summer and autumn kinds); asters, 12 to 15 acres, first drilled and then set out; stocks, about 2 acres; Iceland poppies and gaillardias. Immense quantities of violas, pansies, geraniums, calceolarias, and other bedding plants too numerous to mention, are also grown for selling in boxes or pots to dealers and florists. A large glass building, with some decorative pretensions, has recently been erected as a show or market room, in which dealers can select the flowers which they require, and give their orders. Numbers of costermongers call to take away on their carts and barrows the hardy annuals and other plants which they retail in the streets of London and its suburbs. In reply to the remark that I had neither seen nor heard of any extensive growers of stocks besides himself and Mr. Aldridge, of Petersham, Mr. Mizen said that they were not favourite market flowers, and not very profitable to grow for cutting. They are too heavy and stiff for the modern fashion in floral decoration. Wallflowers are not grown by Messrs. Mizen for cutting, and no bulbous flowers are produced by them for any purpose, as the soil is not suitable. London dung and native guano are the principal manures used. Messrs. Mizen grow a great number of begonias and coleuses in their hothouses, which, with the spaces between them, occupy about 20 acres of ground. Chrysanthemums occupy many houses after mush-

rooms, which follow cucumbers or tomatoes. Ferns and multitudes of other pot plants are also grown in the glass-houses.

As in most places where a large undertaking like that of Messrs. Mizen Brothers is carried on, numbers of small enterprises of a similar kind have sprung up around it. Even the cottagers grow bedding plants in their gardens to sell to hawkers. Land is dear at Mitcham, although it is not a favourite residential parish. For market garden purposes it sells at 400*l.* an acre, and lets at 6*l.*, or even at 8*l.* in some instances. Rates are no less than 8*s.* 1*d.* in the pound, the School Board and Special Sanitary Rates being very heavy, while Poor Rates are 2*s.* 3*d.* in the pound. Labour, too, is dearer in Mitcham than in most other places 9 or 10 miles from London, 22*s.* to 25*s.* per week being common, with 6*d.* an hour for overtime.

Another extensive grower of numerous varieties of outdoor flowers for the London market is Mr. G. Wermig, of Egley and Westfield Nurseries, near Woking. The extent of his flower farm is about seventy acres, devoted to outdoor produce, as he has only two small glass-houses for propagating purposes. Although more distant (about 25 miles) from London than other nurseries named previously in this division of my report, the one under notice is included because Mr. Wermig grows exclusively for the wholesale market at Covent Garden, where he has two stands. As he grows only flowers, foliage plants, and shrubs for cutting, not selling any plants or roots, he must be one of the most extensive growers of cut flowers in the country. He has greatly diminished the number of varieties which he cultivated formerly, in order to render his business less arduous, after a long career of successful production. Subjoined is a list of his productions :—

Violets, to bloom in October and November,	about	10	acres.
Roses	,,	5	,,
Cornflowers	,,	4	,,
Berberis and other foliage shrubs for cutting	,,	12	,,
Chrysanthemums, asters, mignonette, sweet peas, stocks, and a variety of perennials and annuals for cut flowers	,,	28	,,
Bulbs, chiefly narcissi	,,	2	,,
Dahlias, carnations, pinks, &c.	,,	9	,,
Total		70	

The variety of flowers covered by this list, reduced though it has been, is considerable, and few if any other growers

produce such large quantities of so many kinds of flowers for cutting exclusively.

Messrs. Waterer & Sons, growers of rhododendrons, are also at Woking. Messrs. Jackman & Sons, and Messrs. Slocock, of Woking, and Messrs. Fletcher, of Ottenham, are considerable producers of roses; but these are all shrub or plant nurserymen rather than growers of flowers for the market, although they sell some of their blossoms, or at least the rose-growers do so.

There is remarkably little open-air flower-growing in the districts south-east of London, or, indeed, in the county of Kent as a whole, though it is not necessary to travel far to find flowers under glass. To the east, both in Kent and Essex, culinary vegetables and rhubarb are in evidence rather than flowers. One firm of open-air flower-growers, Messrs. H. Cannell & Sons, of Swanley, have a farm of 350 acres at Eynsford, in Kent, 20 miles from London, which I visited. About one-third of the land is devoted to a nursery of flowers, shrubs, and fruit and foliage trees; one-third to farm vegetables for seed; and the remaining third to pasture, corn, and forage crops. The nursery is devoted chiefly to raising flowers to sell as plants or to keep for seed; but cut flowers are also sold. It was chiefly in connection with their hothouses at Swanley that it was deemed desirable to visit this farm. At Eynsford, however, I was much struck with the beauty of the flowers in bloom in almost endless variety. Splendid aquilegias, pæonies, violas, pansies, sweet peas, irises, pyrethrums, carnations, campanulas, and roses were noticed. Over ninety varieties of violas are grown, fully six hundred varieties of dahlias, and about fifteen hundred of chrysanthemums. The last are grown largely for cutting, but 5,000 to 6,000 are annually exported to South Africa, New Zealand, and elsewhere. Violets, too, are grown upon a large scale, 11,000 plants having been sent to one buyer last year. Half an acre of land is planted with choice varieties of the narcissus, both blooms and bulbs being sold. The other products of the farm are outside the scope of this article; otherwise it would have commanded a much more extended notice.

To the north of London few outdoor flowers are grown, so far as my observation and information go, excepting that Messrs. Paul, of Waltham Cross and of Cheshunt—separate firms—produce roses very extensively in their nurseries, and send some of the cut blooms to market. But I visited two growers of roses who produce some outdoors as well as in hothouses. Mr. Matthews, of Ponder's End, grows five acres of outdoor roses for cutting, and he informed me that Mr.

Low, of Bush Hill, Enfield, grew some also. Mr. W. Rumsey, of Waltham Cross, who will be noticed as a producer of flowers under glass, has about four acres of roses in the open. It is worth while to mention that he moulds up his roses for the winter to keep them from getting too forward in the spring, and thus being liable to injury from frost. Some market gardeners grow a few wallflowers, and others produce different flowers in the open, including asters and sweet peas, but not upon a large scale as a rule in the northern parishes. In one, however—Edmonton—Messrs. Heath Brothers are extensive growers of outdoor carnations, pinks, asters, sweet peas, antirrhinums, calceolarias, nasturtiums, dahlias, pæonies, pyrethrums, phloxes, mignonette, chrysanthemums, and a few other flowers; while Mr. H. B. May, who will be referred to in the next section of this article, also grows roses, asters, sweet sultans, and mignonette in the open.

Flower-Growing around London.

B. Under Glass.

The wonderful increase in the hothouse industry in the districts around the Metropolis, and to a smaller extent in the country generally, will be referred to more particularly in connection with the production of fruit. The great majority of glass-house nurserymen grow both flowers and fruit, in order to utilise their houses to the best advantage all the year round. There are some, however, who grow flowers only, and others who produce fruit alone, while with nearly all one branch of industry preponderates greatly over the other. The development in the supply of hothouse flowers to London and other large towns during the last ten years has been enormous, and it is not too much to say that within the last thirty years it has grown from an insignificant to a gigantic business. Any approach to precision in the statistics of flower production, as stated in the first part of this report (p. 288), is unattainable; but what was said of the vast expansion of space required in Covent Garden Market affords a vague idea of the increase that has taken place within the memory of men who have not reached middle age. A very large proportion of the increase is that of forced flowers, cut or in pots, and foliage plants in pots.

Some remarks have already been made in relation to forced flowers of certain kinds for cutting, and others will be noticed presently. They are much less numerous in their varieties, however, than pot plants, a mere list of which would

occupy a great deal of space. Mr. Assbee, in the interesting essay already quoted from, at p. 289, remarks that the succession runs through tulips, hyacinths, primulas, cyclamens, cinerarias, spiræas, deutzias. musks, mignonettes, marguerites, heliotrope, fuchsias, calceolarias, pelargoniums, lilies, geraniums, heaths, roses, chrysanthemums, and many others. Those named are only some of the most familiar varieties of the flowering division. The foliage hothouse plants, he remarks, have recently come more and more into demand, especially since our growers have proved that they can raise them without the assistance of the foreign nurseryman. The palms, for instance, have so increased in quantity and decreased in price as to bring them within reach of a multitude of buyers. In this connection it may be in place to remark that in one large nursery, to be described hereafter, fully a hundred hothouses filled with palms were seen. The other principal forced foliage plants named by Mr. Assbee are ferns, crotons, aspidistras, aralias, and solanums; but as in the case of the flowering plants, this is only a very small portion of the list.

One more remark from the Superintendent of Covent Garden Market calls for attention in these introductory remarks on hothouse flower culture. "The grower of plants for market," he says, "is subject to fashionable caprice more than any other producer. Many flowers, for almost unaccountable reasons, have a run for a few seasons, and then get almost discarded for newer favourites. As it takes some time to raise a stock of any newly fancied variety, this artificial rise and fall in value is very disheartening to growers." The modern æsthetic cult is accountable for many of these changes of fashion, as, for example, the discarding of stiff and bunchy flowers, and the rage for long-stalked classes, such as the marguerites, the lilies, the narcissi, and the chrysanthemums. This, however, will not account for the revival of the extinct fancy for the grotesque cacti, which has quite recently set in. But it is not only the fickleness of fashion in respect of kinds of flowers that has to be considered; there is also a constant change in the run upon colours. In one season there is a rage for white chrysanthemums, for example, and in the next the demand has turned more in favour of some new variation of colour, which may be for the season almost or quite the monopoly of one grower who has raised a great stock before placing any on the market.

It is on the north side of London that by far the greatest development of the hothouse industry is to be found, in relation to flowers as well as fruit. One of the earliest districts

to show this expansion is that of Edmonton, which I chose for my first visit in making a round of glass-house nurseries. Thirty years ago Edmonton was an agricultural parish, and there are still farm crops within its bounds, although it is now in great part densely populated. The soil is a deep and fertile loam on a clay-loam sub-soil, and it was valuable even before Edmonton became a populous parish. Intrinsically the land would be far more valuable for hothouse purposes if there were as few houses as stood in the parish thirty years ago, for now the smoke of thousands of fires is a great disadvantage. Land, however, sells at 300*l*. an acre for nursery purposes, and lets at 10*l*. per annum, while the rents of farms near by are 3*l*. an acre.

There are many glass-house nurseries in Edmonton, by far the largest being that of Mr. H. B. May, who is well known in Covent Garden and in provincial markets as one of the most extensive growers of forced plants in great variety, and especially for his success as a raiser and an exhibitor of ferns, Crimson Rambler roses, calceolarias, crotons, and bouvardias. Mr. May has three nurseries in Edmonton, twenty acres in extent altogether, half the area being covered with glass. Two of the nurseries are entirely devoted to foliage and flowering plants, and one is used mainly for fruit, but also largely for pot plants. Some idea of the number of plants raised under so much glass may be formed from the statement that about 200,000 ferns, 80,000 pelargoniums (commonly called geraniums), 60,000 palms (from one nursery), 20,000 marguerites, 20,000 pots of mignonette (besides boxes for bedding), 12,000 lobelias, and 8,000 clematis plants were disposed of last year. When Mr. May came to Edmonton in 1870, there were not more than ten acres covered with glass in the parish, whereas now he estimates the area covered at a hundred acres. About two hundred men and boys, with a few women, are employed in Mr. May's nurseries, and 2,500 tons of coke are burnt in the furnaces in a year.

Mr. May showed me round the nurseries, and there was a great deal to interest any visitor, although it was too early in the season to see the flowering plants in full beauty. A house full of crotons was first noticed, and then a house occupied by one of the prettiest of ferns, Adiantum Farleyense, suitable for hanging pots. Close by, outside, were thousands of young stocks and a number of blooming heaths, in frames. Next to be entered was a house full of carnations, just coming into bloom. Several houses full of palms, three occupied with azaleas, one with lapagerias, and others with

asparagus plants for foliage, camellias, tiny ferns, indiarubber plants, begonias, lobelias in boxes for potting out, primulas for cutting, aralias, and roses deserve notice. Fern houses were also numerous, including one 430 feet long, another 350 feet, and a third 270 feet. The largest will hold 20,000 pots, one foot apart each way. One large house was full of maidenhair ferns alone. Mr. May grows the beautiful Crimson Rambler rose in great perfection. He also produces roses outdoors, for cutting, in considerable quantity. On January 4 cuttings of rose bushes were being taken for planting out, to be budded in the summer.

No pretence is made towards giving a complete list of the varieties of flowers grown in Mr. May's extensive nurseries, many in an early stage of growth, produced from cuttings, being passed by unnoticed. Ferns, of course, are raised from spores, palms from seed, and most other plants from cuttings. It was interesting to see tiny ferns, just up, being planted out in clumps in boxes, to be afterwards separated and set out in pots, though not often singly, except in cases of valuable varieties. Fog is the greatest meteorological disadvantage at Edmonton, as it causes a thick film to form outside the glass, and, if it lasts long, it kills some kinds of very young plants, such as tomatoes. Mr. May has a great provincial connection, in addition to his trade in London, and sends many plants to the Cape and other distant countries. With respect to the fall in prices, Mr. May said it was considerable in relation to pot plants, but not nearly as great as the drop in the prices of fruit. Foreign competition in flowers does not trouble him much, as he does not deal very extensively in cut flowers; but home competition has greatly increased.

It was impracticable to visit all the parishes to the north of London in which the hothouse industry is extensive, and my next visit in the district was to Ponder's End, on the road to that great centre of glass-houses—Cheshunt. Travelling from Liverpool Street on the Cambridge line, glass-house nurseries become numerous after passing Tottenham Station. Away from the line, indeed, there are many in Tottenham parish. and others at Enfield. My first stop was at Ponder's End, where Mr Matthews has one of his nurseries, the other being at Enfield Highway. He grows both flowers and fruit in his houses, the former at Ponder's End. Here I was impressed with the beauty of the carnations in bloom on April 23. Mr. Matthews makes a speciality of these flowers, which he grows extensively, cross-fertilising in order to obtain new varieties. New Park, Madame Franco, and some new seedlings not named were

particularly striking. Miss Joliffe, another beautiful variety, is grown largely for cutting. Mr. Matthews begins cutting carnations for market in October, and has some in bloom all through the year. His plants, other than new seedlings, are raised from cuttings, some outdoors and some in hothouses. He has twenty-five small houses full of carnations. Ordinary forced carnations sell at 6*d.* to 1*s.* 6*d.* per dozen in the market, choice varieties realising better prices. Mr. Matthews thinks that flower-growing under glass is overdone, in support of which opinion he stated that fruit was gaining ground upon flowers. This view is hardly consistent with Mr. H. B. May's statement that flowers have fallen less in price than fruit, though that remark applied to pot flowers, and Mr.. Matthews was probably referring chiefly to forced flowers for cutting. Mr. Matthews grows ferns in his glass-houses, but no other flowering plants than carnations. He gave me some interesting information as to the great increase of glass in his district, which will be referred to in the concluding article on fruit. Land in the Ponder's End and Enfield Highway district sells at 100*l.* to 600*l.* per acre commonly, the higher price being for building frontages. Bare land lets at 4*l.* to 5*l.* an acre, while old turf, for nurseries, commands 9*l.* to 12*l.* a year.

The next visit was made to Mr. W. Rumsey, whose postal address is Waltham Cross, although his nursery is in Enfield. Mr. Rumsey is a famous rose-grower, who raises new varieties by cross-fertilisation, one of which, named Mrs. Rumsey, is of a beautiful pale pink, with vigorous foliage not likely to mildew. Among a splendid lot ready for show I particularly noticed the beauty of The Ideal (terra cotta), Catherine Mermêt, Ernest Metz, and Crimson Rambler. Mr. Rumsey begins to cut forced roses for market early in March, keeps on into June, and then turns the plants out, as the houses are too hot for them, bringing them in again in November. But he has one house full of the Niphetos variety. the plants having been in it for a year, blooming all the time. As previously mentioned, he grows four acres of roses outdoors for cutting. Mr. Rumsey has a good retail connection for his flowers. Although rose-growing is his speciality, his nursery is a general one for trees and shrubs. It was established in 1809, when there was no glass in the district worth mentioning. Indeed, when Mr. Rumsey took the nursery, thirty years ago, there was no other glass in the neighbourhood besides a little of his own and a few small houses at Edmonton and Ponder's End, while at Cheshunt, Messrs. Paul alone had a hothouse. Now there are hundreds of acres in these parishes covered with

glass. Mr. Rumsey is of opinion that the hothouse industry for flowers and fruit alike is overdone. The prices of cut roses, he says, have fallen fully 75 per cent. since his early days. Even ten years ago he used to get 15*s*. a dozen for Maréchal Niel roses in winter, whereas now 1*s*. to 6*s*. are the usual winter prices. In April forced roses used to sell at 3*s*. to 3*s*. 6*d*. a dozen, but now go at 1*s*. Mr. Rumsey grows a few tomatoes in his houses, but no grapes.

There are hothouses in great groups at intervals through Enfield Highway, Waltham Cross, and in Cheshunt, in some of which flowers are extensively forced. But my visit to the district on the first occasion ended with the inspection of Mr. Rumsey's hothouses and grounds, while I chose as a sufficient representative of the miscellaneous forced flower-growers of Cheshunt Mr. Thomas Rochford, who is the most extensive grower of forced flowers and foliage plants in the country, and probably the largest in the world. His glass-houses cover twenty-four acres of land, not reckoning any waste spaces, and this is the most extensive but one of the glass-house nurseries, the largest being that of his brother, Mr. Joseph Rochford, adjoining, and covering twenty-seven acres. In the former, both flowers and fruit are cultivated; in the latter, fruit alone. Two other brothers in the neighbourhood have respectively twenty and fifteen acres of land under glass, making about eighty-six acres for one family, a great area of glass which is still extending.

In this article only the flower division of Mr. Thomas Rochford's nurseries will be noticed. Two houses of double geraniums —to adopt the popular name commonly used for pelargoniums —were first entered, and next a house full of dracænas, beautiful plants for table decoration. Dendrobiums, of which ten thousand are produced in a season in the nurseries, next claimed attention. In another house some immense basket ferns, worth 15*s*. to 21*s*. each, were very striking for their splendid development. Passing a second house full of dracænas, a pause was demanded to admire a magnificent lot of golden-leaved crotons. Next, house after house of orchids were viewed. These form a new division of Mr. Rochford's multiform business. He is adopting the propagation of orchids on an extensive scale, and already possesses a splendid collection. Some of the houses are devoted to the propagation of new varieties of orchids, and others to the growth of standard kinds for cutting. After noticing a house full of asparagus ferns, and five houses of hydrangeas, we approached a set of houses devoted to palms, grown to an enormous extent, as may be imagined from the statement that at

least a hundred houses are filled with them. If it would be rash to estimate that Mr. Rochford produces millions of palms in a year, it is safe to say that his production exceeds a million, as 25,000 were to be found in a single house. All the pots are bedded in cocoanut-fibre refuse. The plants are of all sizes, from the smallest to perfect giants. Some which were two and a half years old were priced at 4*s*. to 6*s*. each, while other varieties of the giant division, no older, were worth 15*s*. apiece. One splendid specimen, a Cocos flexuosa, was 24 feet high. One of the date palms, Phœnix rupicola, is perhaps the most elegant in the great collection, and it can hardly be beaten for drawing-room decoration, while it has the further merit of keeping well.

Mr. Rochford forces immense quantities of lilies of the valley, which he produces for cutting from the middle of September to the middle of May. The cessation for four months is deliberate; for, as retarded crowns are used in periods of the season when the lilies would not naturally be in flower, they can be developed all through the year. For a considerable time Mr. Rochford had the monopoly of retarded crowns of lilies of the valley in this country, obtaining them from Germany. The originator of the refrigerating process took out a patent for it in Germany, but was apparently unable to sustain it, as he soon found imitators in his own country (Germany) and in the United States. A year or two ago Mr. Rochford put up a refrigerating chamber and plant in his nursery for freezing his own crowns, and after that any nurseryman was able to obtain retarded crowns from Germany. Lilium longiflorum is also grown extensively in the nurseries for cutting or for sale in pots, blossoms being marketed nearly all the year round. About 1,400 dozens of these flowers were sold last season, at 2*s*. to 6*s*. per dozen blossoms usually, or 8*s*. occasionally. Many thousands of chrysanthemums are flowered in hothouses after tomatoes, and large structures are devoted to a wonderful assortment of brilliant caladiums Ferns, from the tiniest seedlings to full-sized plants, filled many houses, about a million being sold annually. Stephanotis, for cutting, is trained under the glass in the fern houses. From 400,000 to 500,000 hyacinths and a million tulips are forced every season, the earliest being ready about three weeks before Christmas. Mr. Rochford does not grow any "bedding stuff," or common flowers of any kind. The management of this wonderful nursery and all its appointments are admirable, and a lover of flowers could hardly have a greater treat than the privilege of seeing over it.

Although the main industry of the multitude of glass-house nurserymen in Cheshunt and the adjoining parishes is the pro-

duction of tomatoes, grapes, and cucumbers, nearly all fill their houses with some kind of flowers in the late portion of the autumn and the winter, if only chrysanthemums. A great many have started on a very small scale, putting up two or three houses at first, and gradually increasing the number if they succeed. In the past, most of them have succeeded well; but it is to be feared that some who have started recently have a hard struggle to make a living. Those who were visited incidentally before the present inquiry was begun complained of the disadvantages at which they produced flowers as compared with the conditions enjoyed by large growers. The salesmen, who have regular customers, pay most attention to producers who can supply flowers in almost any quantity regularly, according to the season, and these men take the cream off the market. Again, extensive nurserymen buy up the stocks of new varieties of flowers, and common kinds are comparatively neglected. Large producers also have advantages in respect of railway rates. Lastly, now that profits are cut down by the fall in prices, it is necessary to produce upon a large scale in order to secure a fair income. The only advantage which the small grower enjoys is the saving of labour expenses when he and his family do nearly all the work of the little nursery.

In some important nurseries not visited, those of Messrs. Beckwith, of Tottenham and Hoddesdon, great quantities of geraniums (pelargoniums) are produced. They are also noted as extensive and excellent growers of tea roses and other flowers.

Whetstone is a parish to the north of London, and much nearer to the metropolis than any of the parishes just mentioned. It was visited for the sake of seeing the nursery owned by Mr. J. Sweet, described to me by a neighbour as "the father of the modern hothouse nursery business." Mr. Sweet himself disclaimed this description, though he was one of the earliest commercial growers of hothouse flowers and fruit. He was at any rate the pioneer of an important and economical improvement in glass-house construction, that of using large squares of glass (24 in. by 18 in.) instead of the small squares (10 in. by 8 in.) previously used. The result is a great saving in first cost and in after repairs also. Mr. Sweet started in business as a nurseryman at Leyton, in Essex, in 1862. There were no glass-houses in the place but his at that time; but there are many now. He came to Whetstone twelve years ago, and purchased the small nursery then on the place, with more land for extension. It is still the only nursery in the parish. The soil is a stiff loam on the London Clay. Land is dear in the

parish, and that which could be bought at 400*l.* an acre twelve years ago is worth 500*l.* now, while one owner refuses to sell any at less than 1,000*l.* an acre. The nursery is 29½ acres in extent, about 20 acres being covered with glass, and nearly all will be covered in the course of twelve months. Some admirable new houses have recently been erected, and others are about to be built. Mr. Sweet is a successful grower of flowers, which he produces in considerable variety, chiefly to sell in pots. The only flowers grown for cutting are camellias and pancratiums, unless the pretty heath-like boronias are also produced for that purpose. Some specially high houses were built for camellias by Mr. Sweet's predecessor, and one of these contains the biggest in the country, now about a hundred years old, while several are forty years of age. Cutting begins in October and lasts to the end of April or into May. As an example of the fall in prices, Mr. Sweet said that, twelve years ago, camellia blossoms sold at 6*s.* a dozen, whereas now they do not realise over 2*s.* a dozen. Camellias flourish under vines, provided that the glass at the apex of the house and at the ends is kept clear.

A great number of splendid mignonette plants in pots, worth 6*s.* a dozen, were ready for market on the occasion of my visit, about 60,000 being produced each season. The pretty ericas, also grown extensively, were in bloom. A special strain of double pyrethrums presented a charming appearance. Also particularly noticeable was a fine variety of the calceolaria, the only surviving kind out of 14,000 seedlings raised by Mr. Sweet some years ago, the rest having died from disease. A lot of very handsome crassulas having excited particular attention, Mr. Sweet said that it was a novelty to grow them as seedlings for the market. They sell well, making 15*s.* a dozen. Other flowers most extensively produced in the nursery are pelargoniums, yellow and white marguerites, heaths in great variety, besides the ericas already noticed, genistas, stocks, cinerarias, hydrangeas, saxifrage, large quantities of Ophiopogon variegatum, aspidistras, and araucarias. Mr. Sweet has left off growing chrysanthemums, as he says they do not pay, which is not surprising, considering that the great majority of growers of tomatoes, grapes, and other hothouse fruit fill their houses with these plants in the autumn. As Mr. Sweet is a great producer of grapes and tomatoes, an opportunity will present itself to refer again to his nursery in the concluding article.

It is necessary now to return to the Thames Valley to notice one of the most admirable forced flower nurseries visited, that

of Mr. George May, of Teddington, who has a high reputation in the market as a producer of cut flowers. His nursery contains over 5,000 running feet of hothouses. A house full of maidenhair ferns was first inspected, and next one occupied by large lilies. Lilies of the valley are also forced for cutting in January, and nearly all through the season. Roses, eucharis, and carnations are the flowers most extensively produced in the nursery. Cut roses are marketed from January to the middle of May, a great many houses, over 100 ft. long and 21 ft. wide, being filled with the plants. Eighteen houses were counted, and it is not certain that all were seen. One was filled with the lovely La France and Baroness Rothschild, the next with La France and another variety, two with General Jacqueminot, one with Niphetos, and the next with these or other varieties. Five houses exclusively occupied by carnations—pink, scarlet, and white—were noticed, and there may have been more. Cutting on a large scale had just begun—on April 22—though a few blooms are cut all through the winter, and they are plentiful till July. Several houses were filled with large lilies of the longiflorum, arum, and other varieties, some being marketed from January till the end of August; two with gardenias, which are cut from March to the end of May; over a dozen with eucharis; and at least three with smilax. Flowers of the Eucharis Amazonica are marketed during the greater part of the year. Mr. May stated that glass-houses had not much increased at Teddington, the land having been encroached upon by residences; but they have increased greatly at Hampton in recent years.

Several nurseries at Hampton were visited, and flowers are grown to a small extent in some of them; but as they were inspected for fruit, they do not require detailed notice in this division of my report.

From 1,700,000 to 1,800,000 crowns of lilies of the valley are forced annually in the well-managed nursery of Mr. B. Matthews, of Whitton, near Hounslow, briefly referred to, though not named, as one in which outdoor roses and narcissi are grown. The lilies are cut for market in all months except June, July, and August, and could be cut all the year round if desirable, as retarded crowns are used to a great extent. Mr. Matthews stated that these retarded crowns had been in use about ten years. Camellias and hydrangeas are also largely cultivated, and chrysanthemums occupy the glass-houses after tomatoes, about 50,000 being usually grown for cutting. Tulips are forced in great numbers, and about 20,000 pots of rhodanthe are sold annually. A speciality in this nursery, not

noticed elsewhere, is the sale of nasturtiums on a large scale, in blossom, in pots. One hothouse is devoted to the growth of eucharis and orchids, and various kinds of pot plants were found in other houses. According to Mr. Matthews, the supply of foreign flowers has greatly increased in recent years, stocks and common flowers generally, such as annuals, being largely sent from the south of France, and tulips and hyacinths from Holland. The soil of Whitton, Hounslow, and Feltham rests on a gravelly subsoil, and the district is a forward one. Land at Whitton is comparatively cheap for a district within thirteen miles of London, selling at 100*l.* to 200*l.* per acre, while agricultural land lets at 2*l.* to 3*l.*, and planted fruit land at 5*l.* to 8*l.* There is not much glass in the three parishes just named; but it is increasing. Market gardens have contracted rather than expanded in the district lately, for most of the space available has been devoted to them for many years, and, as residential building increases, there is some encroachment upon this space.

Messrs. Sander & Co., of St. Albans (which is within 25 miles of London, and is therefore dealt with in this section), were selected as representatives of the most noted commercial orchid-growers, among whom are Messrs. Veitch, of Chelsea (pioneers in the cross-fertilisation of orchids); Lewis, of Southgate; Low, of Enfield; and Cowan, of Liverpool. They were among the earliest of commercial growers upon a large scale, and have done more than any other firm to cheapen orchids in this country by their great importation, which now reaches nearly a million per annum. In answer to an inquiry as to the commencement of the commercial orchid industry in this country, Messrs. Sander kindly gave me the following information:—

> The first firm who began to import and grow orchids to any appreciable extent were Messrs. Loddiges, of Hackney, who appear to have commenced their culture about the year 1812, and continued to be the principal orchid growers for commercial purposes, until their establishment was broken up in 1852. The cultural methods employed, as compared with those now in use, were very crude. Plants were placed in a compost of rotten wood and moss, with a little sand, and no matter from what country or altitude the plants were obtained, all alike were placed in intense heat, the houses being kept moist to saturation point by various means, fresh air, as far as possible, being excluded.

In reply to another question, they stated that the commercial orchid industry was first started in England, but that now there are many foreign growers and hybridisers, most of the large continental nurseries producing orchids extensively, chiefly the Odontoglossums and Cattleyas. The greatest number of foreign

growers is to be found in Belgium. Before the commercial industry was established in this country or elsewhere, the Royal Horticultural Society and several noblemen and gentlemen sent collectors to countries in which orchids are indigenous; but for a long time choice orchids were costly luxuries. Mr. F. Sander, the head of the St. Albans firm, commenced to grow and import orchids in 1873 (having previously been agent to the celebrated collector, Benedict Roezl), and gradually extended his undertaking until it became one of great dimensions. About 4½ acres of the nursery are covered with glass, and, as all the houses open into a long vestibule, the whole round of them can be made without going from under cover. Tanks in which the rainwater off the houses is collected are inside them, such water being much better for orchids than hard water. Between fifty and sixty men are regularly employed. New plants of various kinds are produced, as well as orchids, and many of great beauty were noticed in the course of my inspection.

The first plants to attract my attention were some new and splendid dracænas, obtained by Messrs. Sander this year from the west coast of Africa. One of them, Dracæna spectabile, had been known to botanists for some time, but could not be found by collectors until the early part of the present year. Some new caladiums and palms were also noticed, one of the former being very striking, with its ruddy crimson leaves edged with green. Messrs. Sander also grow a great number of eucharis plants, from which blossoms are cut for sale all the year round. Some beautiful varieties of streptocarpus were noticed, one of them with a charming white bloom having been raised by and named after Mr. Sander; also some choice begonias, araucarias, crotons, and double petunias. Nothing among the miscellaneous plants was more striking than Acalypha Sanderi, the flowers of which, long pendant tails, are wonderfully handsome. The variety, which is the only one of its species that blooms, the other kinds being grown for the foliage alone, was obtained from New Guinea about two years ago, and has been brought out commercially this year for the first time.

To turn to the orchids, the most interesting department of the nursery was found to be that in which cross-fertilisation and the development of crosses are carried on. This work is pursued on a very extensive scale, something new in hybrids (as they are usually styled, instead of crosses), whether worth perpetuation or not, being raised every week from seed taken from plants artificially fertilised. Orchids are very rarely self-fertilised in this country, although they are bi-sexual. The seed, which is sown in pots in which orchids are growing,

as it does best when thus treated, is extremely small, as are the seedlings also when first visible. The latter are transplanted with great care into flower-pots only one inch high and the same measurement across the top. It is a curious sight to see a house full of seedlings in these tiny pots, placed upon crocks for perfect drainage. The young plants are grown in peat and moss, without any earth, the moss being supposed to keep the peat sweet. Even large plants require but little soil in the pots, and their roots grow partly outside the latter. Very careful treatment is needed for the seedlings, as an excess or a deficiency of water is quickly fatal to them. Other houses were found full of larger seedlings in larger pots. A special ventilating pot has been brought out by Mr. Sander, in which all young orchids are hereafter to be grown. The plants, according to variety, are three to five years from the time of sowing the seed in coming into blossom. Several valuable new hybrids were seen, one being worth 80 guineas. Another orchid has been sold this season at 100 guineas. Plants of one kind or another are in flower all the year round, some chiefly in winter, and others mainly in summer, while a few flower twice a year; but the greatest number are in bloom at the end of May and in June. Orchids are divided into two main classes: the epiphytes, found growing on trees or rocks, and the terrestrial kinds, which grow in the ground. Nearly all those which are indigenous to England (about 50) are terrestrial, none being found on trees, though at least one grows on a grass, or partly on the grass and partly in the ground. Most of the much more numerous imported orchids, on the other hand, are found on trees or rocks. Fortnightly sales of imported orchids are held by Messrs. Sander at Messrs. Prothero & Morris's sale rooms in Cheapside.

But little space is available for a description of the many lovely orchids seen in blossom, or of those—not a few—which are more curious than beautiful. A few of the most striking may be briefly described as follows:—Cattleya labiata autumnalis, for one plant of which Lord Howe refused 500*l.* some time ago, its foreign source having been lost for 70 years, at the end of which time the variety was rediscovered in Rio Janeiro by one of Messrs. Sander's collectors; Cattleya Warneri, one of the loveliest of its section; Lælia purpurata, a beautiful purple-tipped flower; Cattleya gigas, a splendid and gigantic flower, with light mauve sepals and petals, and purple cup edged with light mauve; Peristeria elata, the "dove flower," or the "Holy Ghost flower" of the Spaniards, the centre of each blossom resembling a waxen dove; Cattleya Schröderæ, one of

the best of its section; an unnamed hybrid worth 75 guineas, something like Lælia purpurata, one of its parents; another new hybrid of the Sobralia class, all of which give five or six flowers, one after another, from the same base; Cypripedium Mastersianum, one of the "lady's slipper" class, worth 10 guineas a few years ago, but now only 7*s*. 6*d*.; Odontoglossum Alexandræ (named after the Princess of Wales), of which there are many variations in colour, some plants, though not in the nursery, being worth 200*l*. to 300*l*.; the "Necklace" orchid from Borneo, with its long pendant spikes each covered with 20 to 30 blooms, a wonderful plant, but not rare; and a variety of Miltonia orchids, filling one house, some bearing 12 to 14 blossoms on one spike. With respect to prices, I was informed that 3*s*. 6*d*. is about the lowest price for an orchid plant properly grown, while those which are freshly imported are worth from 2*s*. upwards before being potted. Anything rare and striking sells as well as ever; but of course the prices of varieties fall as they become plentiful. For example, orchids of the variety referred to above, as that for one plant of which 500*l*. had been refused about seven years ago, are now sold at 5*s*. each. Again, another variety, which commanded a guinea a leaf for propagating purposes a few years back, now sells at 7*s*. 6*d*. a plant. Blossoms are commonly sold at 9*s*. to 12*s*. a dozen. Messrs. Sander have just completed the publication of a sumptuous book on orchids, entitled "Reichenbachia," in four great volumes, each of which contains ninety-six admirably executed coloured plates. The descriptive letterpress is by Mr. F. Sander, and is printed on his premises, where the work is published.

It is impossible to notice separately the numerous hothouse nurserymen visited who grow fruit chiefly, but also force some flowers. Several were found in the neighbourhood of Belvidere and Erith; but only one, who grows roses, lilies, and chrysanthemums on a considerable scale, need be mentioned here. This is Mr. George Stapley, of Erith, whose nursery was a picture of prosperity at the time of my visit.

Passing further into Kent, Swanley, the great centre of the hothouse industry of that county, is reached, about eighteen miles from London. Here there is a great quantity of glass, but nearly all the nurseries are devoted almost exclusively to fruit. So far as my information goes, there are only two important exceptions, the chief of which is Messrs. H. Cannell & Sons' "Home for Flowers," one of the most remarkable flower nurseries in the country. It is seventeen acres in extent, about four acres being covered with glass. Almost all kinds of hot-

house flowers are produced here in great perfection, for sale as plants, for cutting, or for seed, some varieties being grown for all three purposes. Messrs. Cannell do not send anything except cut pæonies to Covent Garden, but have a great private trade in the United Kingdom, the Colonies, and foreign countries. It is impracticable to name all the flowers produced in this nursery, and it must suffice to mention those which particularly attracted my attention. Messrs. Cannell are frequent and very successful exhibitors at the principal flower shows, and the first objects noticed were some magnificent gladiolus-flowered cannas, just ready for an exhibition. Some beautiful gloxinias were next seen, these flowers being extensively grown, single and double. In another house was a great variety of the cactus tribe, now coming into fashion once more, after having been neglected for many years. Passing through houses containing splendid varieties of streptocarpus, fuchsias, and double petunias of many tints, we came to a splendid lot of double begonias. Near by was a house devoted to single begonias, equally beautiful. The singles sell at 18*s*. a dozen, and the doubles at 30*s*., named varieties. These flowers, which are largely cultivated in the nursery, need artificial fertilisation. Carnations also are grown in great number, and in a high state of perfection, and cyclamens on a considerable scale.

Nothing in the hothouses excited my admiration more than some magnificent giant calceolarias. These flowers are all fertilised by hand, a boy sitting for weeks at a time and doing nothing else. The seed of the best is worth ten guineas an ounce. One house was filled with stove plants of various kinds, including orchids, some of which require the temperature of a stove house. It was curious to notice in another house the contrast between the oldest white fuchsia and the beautiful Duchess of Edinburgh, standing side by side, all due to cross-fertilisation and selection. Single and double pelargoniums are grown upon a large scale, and they include some wonderfully fine strains. Nothing equal to the singles in size and colouring of blossom had been seen by me elsewhere, and it was not surprising to learn that the foreman of the nursery claimed that they were the finest in the country. Bees do the crossing among these flowers, and varieties come by chance from the seed, so that no grower knows what he will get. He may produce a new strain, worth 5*l*. to 10*l*. per plant, or nothing fresh of any considerable value. A fine lot of roses was noticed, and I was informed that 6,000 were sent to Johannesburg last year. Carnations and picotees are among the other flowers which are cultivated

upon a large scale. The great production of chrysanthemums, dahlias, and violets was mentioned (p. 522) in the open-air section of this report. Some of them are produced in the open ground of the nursery, and others at Eynsford.

The other nursery at Swanley in which flowers are extensively grown is that managed by the Executors of the late Mr. Philip Ladd, who also have a great quantity of glass at Dartford Heath and Meopham, though flowers are grown chiefly, if not exclusively, at Swanley. These nurseries were visited mainly to see fruit, to which they were almost entirely devoted a few years ago. Now there are thirteen houses of palms in one block, and a good many more in another. The production of palms in the hothouse nurseries around London is simply marvellous. The growth of the ficus in the nursery is also considerable. As for geraniums, 61,000 have been produced this season, with great numbers of pelargoniums, fuchsias, petunias, lobelias, genistas, and other flowers. Indeed, tomatoes, of which Mr. Ladd was formerly one of the largest producers in the country, have given place to flowers to a great extent, only late fruit being produced after pot flowers have been got out of the houses. The explanation is that the soil got tired of tomatoes. The eucharis is cultivated considerably for cutting, and the asparagus plant for the same purpose; also tuberoses, arum lilies, marguerites, and other flowers; while great quantities of ferns are raised, and chrysanthemums occupy the grape-houses in the winter. As this nursery was visited for fruit, comparatively little attention was given to the flowers.

In concluding this branch of my subject, it may be remarked that the great extent and importance of the industry is a sufficient excuse for the devotion of so large a proportion of the space at my disposal to flower-growing around London.

Flower-Farming in the Provinces.

Inquiries in different centres led to the conclusion that there were few, if any, very extensive flower-growing districts in the provinces, besides the bulb farms already noticed. Several considerable growers were heard of, but in nearly all cases they are scattered. Around most of the large towns, however, flowers are grown more or less in market gardens and nurseries, and in some cases by small holders also; while, in a few districts, occupiers of farms of considerable size are engaged in the production of flowers to a small extent. The impracticability of visiting any considerable proportion of the districts surrounding the towns was obvious, and it therefore appeared that the only

feasible course to adopt was to obtain by correspondence information as to the sources of the supplies of flowers to the principal provincial markets from the market or other resident authorities, except in reference to certain districts, which I had occasion to visit in connection with fruit-farming, or which I had visited on previous occasions. The inquiries related to fruit as well as flowers, and to glass-house as well as open-air culture. The portions of the replies relating to flowers only will be given in this section of my report; but it will not be convenient to separate references to hothouse and open-air flowers.

In the first place districts visited will be noticed, and Evesham and its neighbourhood may be properly taken to begin with. The extent to which flowers are produced there proved to be less than reports of supplies to Manchester led me to expect. Wallflowers and violets are grown by the acre, mainly under fruit trees, and a beginning has been made in the cultivation of the narcissus by a few market gardeners, though only the Ornatus variety was named by those who gave the information. Pinks also are grown somewhat largely, and lavender is to be found on many plots of land. Other flowers, however, are produced only on a moderate scale, and mainly in the small market gardens. They include carnations, gaillardias, pyrethrums, asters, pansies, daisies, sweet sultans, gladioli, roses, and stocks. Flower culture appears to be increasing slowly in the Evesham district.

With respect to Toddington, referred to by a Manchester correspondent as one of the sources of flower supply to that city, the manager of the Toddington Orchard Company states that but few flowers are produced there in the open beyond some narcissi under trees where bush fruit cannot be grown. Some also are forced in the hothouses; but the great fruit farm does not appear to be an important source of flower supply.

At Pershore it was stated that no flowers worth mentioning were grown there for market, and the only piece of flower ground seen was three-quarters of an acre of the Ornatus narcissus in a nursery at Pinvin, close to Pershore station, belonging to Mr. Jones, of Evesham.

When at Plymouth I attended the fruit, vegetable, and flower market, and obtained information as to local supplies from a market inspector. He stated that considerable quantities of flowers were grown within a radius of ten miles from the town, the growers attending the Plymouth and Devonport markets, and selling their own produce, chiefly by retail. At Tamerton, five miles from Plymouth, where there is a good

deal of glass, flowers are grown in the open and in hothouses. At Saltash, again, and in the immediate neighbourhood of Plymouth there are some rather extensive hothouses, in which flowers are forced. At Beer Alston (Devon) and many other parishes around the town flowers are grown more or less—chiefly by small cultivators, so far as open-air culture is concerned. Roses, pansies, wallflowers, stocks, lilac, anemones, forget-me-nots, narcissi, and a variety of bedding plants were on sale in the market on the day of my visit. Flowers are also imported from the Scilly Isles and foreign sources, and disposed of by salesmen to shopkeepers in Plymouth and Devonport.

Inquiry at Exeter confirmed the information obtained at Plymouth as to the production of flowers in Devon being chiefly for local consumption. Mr. Pearson, the market superintendent at the former town, stated that a great quantity of flowers was produced for local markets, but not for others. Flower-growing, however, he described as on the increase in the county.

At Polgrain, near Penzance, Mr. Frank Craze has the largest market-garden farm in Cornwall, where he grows narcissi to a considerable extent, and forces hundreds of thousands annually, with some arum lilies, sending his produce chiefly to Liverpool and Leicester. On the coast of Cornwall, between Penzance and Land's End, chiefly at Mousehole, some narcissi, wallflowers, and a few other flowers are produced.

Information to the effect that many outdoor flowers would be found in the Worthing district was not verified by what was seen and learned during a visit to that great centre of the hothouse industry. Even hothouse flowers, except chrysanthemums and a few other flowers cultivated to utilise the grape-houses and find employment for men in winter, are not produced as extensively as might have been expected, partly because the early forcing of fruit, which is the great feature of the Worthing industry, leaves comparatively little time for occupying the houses with flowers in the winter. Mr. Barnwell grows roses and various pot flowers, in hothouses, for his local trade, including geraniums, fuchsias, carnations, and marguerites, with a few arum lilies, and forces narcissi, tulips, and hyacinths, while he grows about 10,000 chrysanthemums for cutting. Mr. Piper, who has the greatest quantity of glass in Worthing, cultivates no flowers worth mentioning but chrysanthemums, which he grows chiefly to employ his numerous hands in winter. These flowers he has for cutting from October to December inclusive. Mr. Sparkes, who is one of the most extensive cultivators of flowers among the nurserymen of the

place, produces 60,000 chrysanthemums annually, and large quantities of roses, geraniums, and lilies. He had five houses full of roses on the occasion of my visit, and he appears to grow them admirably, having some ready for cutting on every week-day in the year, from one dozen to 200 dozens a day. Catherine Mermet, Clothilde, and two other varieties are grown. It is a noticeable feature in the cultivation of roses in this nursery that they are kept in the houses all the year round, and from year to year, whereas the usual custom is to remove them outdoors for part of each year. Mr. Sparkes's roses, however, are planted in the soil of the houses, and not in pots, and he states that they live for at least ten years, being forced all the time. There is a great saving in watering and other labour from growing the roses in the soil of the houses. The geraniums are all grown for cutting. A few wallflowers are forced for cutting in January, and others are grown outdoors for marketing in the spring and later. Neither bedding nor herbaceous plants are grown to any considerable extent in Worthing, Mr. Sparkes says, and the forcing of the narcissus and other bulbous flowers is on a very small scale. Most of the flowers from this nursery are sent to London, Brighton, and northern markets. Mr. Hollis, a neighbouring nurseryman, was mentioned as one of the best flower growers. He produces the same classes as those grown by Mr. Sparkes, and there are other growers. But Worthing is devoted mainly to fruit culture, flowers being little more than by-products there.

Mr. Thoday, of Willingham, who was visited in the course of a journey through the principal fruit districts of Cambridgeshire, produces flowers to some extent. He has about five acres of open ground devoted to asters, sweet peas, sweet sultans, stocks, and narcissi, the last being grown only for forcing. In his hothouses he forces carnations, which he began cutting in October, and was cutting still in the middle of April; also roses on a somewhat extensive scale, a quantity of lilies, gladioli, chrysanthemums, and bedding plants of various descriptions. Carnations are grown from cuttings and kept in pots in the open during summer, being brought into the hothouses in the autumn. About 20,000 chrysanthemums are grown each season. None of the other fruit growers in Cambridgeshire visited, except Messrs. Richard Bath & Co., already noticed, at p. 315, grow flowers, and it appears that very few open-air flowers are produced in the districts traversed. Nor is there much glass, though a few growers in other parts of the county have some hothouses, and probably grow flowers more or less in them.

In writing on "The Food Supply of Manchester" (in this Journal, vol. viii., 1897, p. 205), it was incidentally mentioned that a good many of the small holders around the city grow flowers as well as fruit and vegetables for the market. Mr. Frank Law, of Sale, is the most extensive flower grower in the neighbourhood of Manchester. He occupies fifty-six acres of land, a portion of which is covered with glass, and he forces a great quantity of bulbous flowers, including tulips and narcissi, for which, as for other flowers, he has a high reputation in the Manchester market. Rhododendrons are cultivated on a considerable scale, and many other flowers; but as my article on Manchester related to food only, very few notes were made on flowers. One of the most striking features in the management of the nursery is the economy of expenditure. Many of the glass-houses are cheap structures, without any brick foundations, matchboards being used for the sides and ends. Mr. Law said that the boards kept out frost as effectively as bricks. Equally striking was a plan of using movable glass-houses with movable hot-water pipes, which is very uncommon. Plants of certain kinds are grown in the open, and when the time comes for forcing them the movable hothouses are put up over them. In the article above referred to, it was mentioned (p. 223), that many of the small holders obtained a living off an astonishingly small area of land —even off one acre. This they are able to do mainly by raising "bedding stuff" in frames, and flowers in the open ground, while here and there a small hothouse is to be seen. In order to supplement my information as to the flower supply of Manchester, a letter of inquiry was sent to Mr. George Myers, Superintendent of the Markets in that city, who had been very obliging in connection with the food supply. He states that the earliest flowers come from the Scilly Isles, the next from the Channel Islands, and later supplies from the South and West of England, including some from the great fruit and flower grounds of the Toddington Orchard Company, while the Spalding district supplies the bulk of bulbous flowers, and Middlesex sends various kinds. Local supplies, Mr. Myers adds, come chiefly from Sale, Bowden, Stretford, and Timperley; and he mentions that Mr. Frank Law sends from six hundred to seven hundred boxes of flowers daily into the market.

Having completed the notices of flowers in districts visited, it remains for me to summarise the information kindly supplied by authorities in some of the principal towns of the country not already represented in the preceding portion of my report.

Messrs. R. B. Pringle & Son, of Newcastle-on-Tyne, state

that flowers are not grown extensively in Northumberland or Durham, and that supplies come chiefly from southern markets, Lincolnshire, and midland counties, and, to a smaller extent, from various other parts of England and from Scotland. But, during the summer, quantities of common outdoor flowers arrive from the outlying villages on Tyneside and the West of Durham. Very few flowers are raised under glass in the district, and they are mostly produced by Newcastle florists, the rest being contributed in small lots by private producers when they have more than they need for their own use. Large quantities are received from the South of France and the Channel Islands.

Carlisle, Messrs. Little & Ballantyne report, cannot be considered an important market garden centre. As the population mainly consists of the labouring and artisan classes, there is not a great demand for choice flowers, and common sorts are supplied by the neighbouring rural population, many of whom make it a practice to bring a few bunches for sale in attending the market mainly for other purposes. Messrs. Little & Ballantyne themselves meet a large proportion of the demand for choice flowers in their county, the supply representing an important branch of their business, and one to which they have been devoting an increasing portion of their great nurseries at Knowfield. Other supplies are mainly from the South.

Open-air flowers, Mr. J. W. Davison, City Accountant at York, reports, are grown extensively in the rural districts around the city, and in East Yorkshire. He intimates that there is a large and increasing quantity of glass in the nurseries of York and its district, and that large proportions of the supplies of common and choice flowers alike come from within a radius of six miles from the city.

Mr. Richard Boston, of Leeds, states that the principal local sources of the supplies of flowers are the gardens of noblemen and gentlemen in the districts around the town, while Messrs. Backhouse & Son, of York, send large quantities. It is hardly necessary to state that Leeds is one of the many good Northern centres for the disposal of flowers from the South of England and foreign countries.

In the course of an interesting communication relating to the Birmingham flower and fruit supplies, Mr. John Pope, of King's Norton, remarks that flowers in the open are not largely produced in the neighbourhood of the city, but that a great many amateurs and gentlemen's gardeners grow them, and send them to the market auction sales, at which nearly all the wholesale trade is conducted. The number of growers keeps increasing, as it is recruited largely from the ranks of gardeners

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who erect a few hothouses; but there is not a large grower in Warwickshire. A few small plots of land at Kenilworth and Erdington are devoted to the cultivation of two or three varieties of the narcissus. Mr. Pope's firm is the only one growing narcissus for cutting upon a large scale in the district, some six miles from the city, in Worcestershire, where about three acres are devoted to the cultivation of this class of flower in variety, and this area is increasing. It is curious to notice that Messrs. Pope find a good demand for bulbs in Holland, as the Dutch growers keep renovating their stocks from this country, which suits the bulbs better than Holland. There are no large growers of flowers under glass in the district; but the tomato growers produce some, and most of the noblemen and gentlemen within twenty miles of Birmingham send in what hothouse flowers they have to spare. In the immediate neighbourhood of the great manufacturing city nearly all the old firms of nurserymen have been "smoked out," as Messrs. Pope have been twice in forty years. They are the only survivors of the old firms, and one of their nurseries, five miles from Birmingham, has been rendered almost useless from the establishment of works and the development of railway traffic. Mr. Pope's great-grandfather started in business as a nurseryman about a hundred and sixty years ago. From the remarks of my correspondent it may be assumed that Birmingham is principally supplied with flowers from the South of England, Evesham, Lincolnshire, the Channel Islands, and foreign countries.

Messrs. Harrison & Sons, of Leicester, kindly prepared for me some particulars as to the flower supply of their large and important manufacturing town. The market, they state, is an open one in the centre of the town, excepting one bay of the Market Hall, which is devoted to flowers and plants in pots, of which there is an abundant supply. There are some well-fronted shops in the main streets, with fine displays of first-class flowers, which find customers among the well-to-do classes; but the larger trade is done in the market with the younger members of the thrifty population, for personal and home decorations. The population of the town is about 200,000, and the light and comparatively clean classes of manufactures afford good wages to the young male and female operatives, many of whom are good customers for flowers. The early supply of flowers arrives in January from the South of France, and a little later from the West and North. Some come from Jersey during February and early in March, with a plentiful supply from the Scilly Isles, mostly narcissi grown in the open. Then follows in April the big supply of the season from Holland, especially of

hyacinths, tulips, and narcissi. For some years past our English growers have discovered that the narcissus can be easily grown in this country, and several in Lincolnshire in the neighbourhood of Boston and Spalding grow these flowers extensively, cutting the flowers for market and selling a portion of their bulbs afterwards to the trade. This enterprise has brought out some lovely new varieties of fine size, substance, and colour. For hyacinths, tulips, and other similar bulbs requiring a sandy soil, we cannot rival the Dutch growers, one reason being that in Holland water is kept evenly in the sub-soil within a suitable distance of the bulbs. During the month of April many hundreds of shallow boxes of blooms find their way to Leicester Market twice weekly, keeping up a constant supply after that of France and the Scilly Isles, until flowers grown locally are ready. The choice and more delicate flowers are grown by local florists, within five or six miles of the town; also plants in pots such as geraniums, cinerarias, fuchsias, petunias, ferns, bedding plants in variety, chrysanthemums, and others; but most winter flowering plants are bought from growers around the Metropolis who hold annual auction sales in September, which include cyclamens, ericas, epacrises, and palms.

Mr. Joseph Radford, Clerk of the Markets at Nottingham, has obliged me with a report, in which he states that good supplies of open-air flowers are grown locally, while large quantities are received from the Scilly and Channel Islands, Cornwall, Lincolnshire, and Cambridgeshire, and hothouse flowers from various home and foreign sources. Glass-houses are not numerous in Nottinghamshire, but are increasing, Radcliffe-on-Trent being the parish in which the greatest number is to be found. The most extensive local hothouses are those of Messrs. Buckoll, King & Co., who are the largest fruit and flower salesmen in the city. Other local growers named are Messrs. Merryweather, of Southwell; Lowe, of Beeston; Pearson, of Chilwell; Barrett, of Radcliffe; and Biddles, of Loughborough. When in the Nottingham and Southwell districts some years ago I learned that on a great many of the small holdings flowers were grown for Nottingham market, and wild flowers as well were collected by the women and children for the same destination.

Cheshire, Messrs. Dicksons, of Chester, report, is not a great county for flowers, and the supply of Chester appears to be derived mainly from outside sources. Almost the whole of the report, which they have kindly prepared for me, relates to fruit.

Lincoln, Mr. J. T. Drury, Market Superintendent, states, gets its flowers chiefly from local growers, most of whom pro-

duce only on a small scale. The most extensive producers are Messrs. Pennell & Sons, of Lincoln, who have a large nursery; Mr. Illman, of Lincoln; and Mr. Herring, of Bracebridge. All these firms have a good deal of glass.

There are many more or less extensive growers of flowers, both in the open and under glass, around Norwich, Mr. Thomas Rose reports. The parish of Lakenham, a hamlet of Norwich, is part of the great estate of Mr. E. S. Trafford, for which Mr. Rose is agent, and the larger part of it is let to market gardeners, who grow flowers as well as fruit and vegetables. A portion of the estate near Wisbech, again, is one of the greatest fruit and vegetable districts of the Eastern Counties, and flowers are extensively produced there. Within the precincts of Norwich, and a few miles away, there are many extensive cultivators of flowers as well as fruit, some of whom, if I understand Mr. Rose aright, have one to five acres covered with glass. Mr. Church, of Mulbarton, is mentioned as one extensive grower; and Mr. Hannent, of Hellesdon, as another. A correspondent states that Messrs. Daniels, of Norwich, produce flowers on a large scale, for cutting, in their extensive nurseries. In the districts contiguous to Yarmouth and Lowestoft, again, flowers are produced for market by a good many growers.

Around Ipswich flower-growing is not extensive, either in the open or under glass. Small occupiers supply most of the common flowers either direct to consumers or to the shops, there being no wholesale market in Ipswich. There is a provision market in the town, held every Saturday, in which local market gardeners and shopkeepers have stalls for the sale of their goods. The district of Beccles is one named by my correspondent as a source of open-air and hothouse flowers.

Essex, like Suffolk, is not much of a flower county, except with respect to the cultivation of roses by Messrs. Cant (two firms), and Prior, of Colchester; Mr. Bunting, of the same town, who is one of the largest importers and growers of choice lilies and other flowers; and Messrs. R. Wallace & Co., also of Colchester, who have made a speciality of rare bulbous flowers.

Flowers are grown to some extent in the market garden districts of Bedfordshire and Hunts, but not very largely, so far as my travels in those districts for a purpose other than the present inquiry have enabled me to judge.

Mr. William Newman, Superintendent of the Brighton Market, believes that flower-growing is very much on the increase in Sussex, a county already noticed in connection with Worthing. A good many flowers are produced in the open

around Brighton, while large quantities are received from Worthing, Henfield, and other parts of the county, as well as from foreign sources. Hothouses are greatly on the increase at Henfield and other places, as well as at Worthing and Littlehampton. At Hailsham and Handcross there are two extensive growers of flowers.

Strange to say, there is no flower or fruit market in the important town of Southampton, and an inquiry addressed to that place was handed on to Mr. Cowan, Director of Technical Education to the Hampshire County Council, who has not mentioned any extensive flower cultivation in his reply, which relates to fruit mainly. Many of the florists' shops, however, appear to be mainly supplied from the Channel Islands.

Nearly all the other counties south of London have been noticed in connection with visits, and a jump from Hampshire to Somerset has now to be taken. The Bath district is an important one for flowers, and Mr. Thomas Kitley, of Oldfield Nurseries, in that city, has favoured me with some details on the subject. No town, he believes, is better supplied with flowers and fruit by local growers. A few classes of flowers are produced in great quantities, such as the Christmas Rose (the true Bath variety, and the best of all the hellebores with respect to quantity and purity of bloom), violets, narcissi, chrysanthemums, and lilies of the valley. In smaller quantities there are Lilium candidum, L. Harrisii, L. auratum, roses, irises, anemones, pæonies, pyrethrums, and a great variety of annuals. Under glass, roses, lilies of all kinds, tuberoses, stephanotis, pelargoniums, and the usual variety of stove and greenhouse plants are produced. The principal parishes for flowers are Lyncombe, Widcombe, Weston, Batheaston, and Englishcombe. Mr. Walter T. Ware, as well as Mr. Kitley, has nurseries near Bath. Messrs. Kelway & Sons, of Langport, are extensive growers of gladioli and other flowers. In another part of Somerset, the Chew Valley, near Bristol, Mr. Walker, who farms there, informs me, a few varieties of the narcissus were grown in small plots by farmers and others for many years, up to about ten years ago. The industry arose from a boy having brought some bulbs from Cornwall as a present to his mother, who cultivated them and sold the flowers in Bristol at a penny each. As her bulbs increased, she realised a considerable return, and saved enough money for the purchase of her small holding. Many of the farmers followed her example, growing up to a quarter of an acre each, and selling the flowers at Bristol. But they appear to have had only the old double daffodil, the pheasant eye, and

a scented double white variety; and, as the flowers were late in the district, while competitors elsewhere grew many more varieties, as well as earlier crops, the industry became unprofitable about ten years ago, and is now practically extinct in the Chew Valley.

There is a fine market hall at Shrewsbury, in which the wives and daughters of occupiers of land in the district occupy stalls, Mr. R. E. Turnbull states, and some of them dispose of flowers as well as other products. The flowers produced by farmers and cottagers are of the hardy kinds, and, although the soil and climate of Shropshire are suitable to open-air flower culture, the supply as a rule is limited to local requirements. There are several shops in Shrewsbury kept by flower growers. The market gardeners have hothouses, and send some of the flowers grown in them to other than local markets; but it appears that the extent of glass is not great.

With respect to Wales, which is not a great flower-producing country, inquiry was made at Llandudno, as likely to be the chief consuming centre in the northern division. Various kinds of flowers for cutting are grown around the town, but not to any great extent, and there is very little glass in the district. The bulk of the flower supply is from Manchester and Liverpool.

For South Wales, Cardiff and Newport were taken as the chief market centres, although the latter town is in Monmouthshire. Mr. W. J. Grant, Lecturer on Agriculture, Dairying, Horticulture, and Arboriculture to the Monmouthshire County Council, kindly gave information in relation to both centres. Bearing in mind the growth of population in Cardiff, he says, there is comparatively little open-air flower culture in and around the town or in other parts of Glamorgan, and the greater portion of the supply is obtained from the Channel and Scilly Isles, Cornwall, and Evesham. Messrs. Case & Sons, of Rumney, near Cardiff, are by far the largest owners of glass-houses in South Wales, while Messrs. Phelps & Co., of Llanishen, and Mr. Crossling, of Penarth, also force flowers in their hothouses, and Messrs. Tresider, of Pwllcoch and Cardiff, combine the sale of cut flowers with their extensive nursery business. In short, the glass-house industry of South Wales seems to be almost entirely concentrated in and around Cardiff, and it does not appear to be increasing to any great extent.

In Monmouthshire, since 1891, Mr. Grant remarks, in consequence of the persistent efforts made by the Chairman of the County Council and the Technical Education Committee to extend information and facilities in relation to horticulture

among farmers and small holders of land, the variety of products has greatly increased. Small occupiers, as well as market gardeners, have found it advantageous to grow open-air flowers for the direct supply of consumers, wallflowers, asters, stocks, chrysanthemums, and lilies of the valley being the kinds most largely cultivated. The supplies of such flowers to Newport are chiefly from the districts round Magor, Caldicot, and onwards towards Chepstow. There are no extensive glass-house nurseries in the county; but there is a steady increase in small houses put up by men who do nearly all the work in them. The valuable work done by Mr. Grant for the County Council is indicated by the scheme of instruction described in printed circulars and reports, which will be better noticed in reference to fruit-growing.

Concluding Remarks on Flower-Growing.

There is no doubt that flower-growing is greatly extending in this country, and that competition among home growers is becoming more and more severe. Foreign supplies of flowers have increased, but not nearly as greatly in proportion as home supplies, and it seems clear that home growers have gained ground in relation to their foreign rivals, except with respect to flowers for the growth of which foreigners have extraordinary natural advantages. It has already been intimated that there is a danger of the culture of the narcissus being too much expanded; also that the chrysanthemum is produced in excess of the demand. Again, in the production of violets, the warm and sunny South of France has an advantage not possessed by this country, while Holland maintains her hold upon the hyacinth and tulip trade for a similar reason. But whether the production of flowers as a whole is gaining ground upon the consumption or not, it is difficult to determine. It is true that the prices of flowers have fallen generally, as those of nearly all other commodities have; but production, at any rate under glass, has been cheapened, and if a fair profit can be obtained, the fall in prices, without which the existing consumption of flowers would be impossible, does not necessarily imply over-production. There is some difference of opinion among growers upon this point; but nearly all agree in stating that profits are now so small that production on a large scale is necessary to provide a decent income. Mr. George Monro, of Covent Garden, who is certainly one of the best authorities, is of opinion that supplies of cut flowers are "pretty nearly overdone," as indicated by the great glut that occurred in the summer of 1897.

Prices, he says, are much lower than they used to be, and only the best growers do well.

Thus, in flower-growing, as in nearly every other career, inquiry leads to the conclusion that "there is plenty of room at the top." In this industry, moreover, there is such a very wide scope for the exercise of superior skill, industry, and alertness that it is not surprising to find some who are engaged in it doing remarkably well to all appearance, while others are struggling on and hardly paying their way. That a man with only a little capital, starting in a small way, has many disadvantages, as mentioned in a preceding portion of this article, is certain; also that his chance of saving money and extending his business quickly is much less than it was a few years ago; but energy and superior capacity enable many such men to overcome all difficulties and attain success.

To the casual looker-on, who knows nothing of the drudgery of the industry, flower-growing seems a delightful method of getting a living. That it is an entrancing pursuit there is no doubt; but it is equally true that it is a very arduous one, requiring the most careful forethought, ceaseless attention, and abundant energy. Fortunately for those who might be tempted, without any knowledge of it, to embark capital in it, flower-growing, if at all comprehensive in scope, so obviously requires a varied and extensive technical knowledge that anyone can see that a thorough training is necessary to a man who intends to adopt it as a business, especially if hothouse flowers are to be produced.

In concluding my remarks on the floral division of the subject I have to thank all who are named in the preceding pages as having allowed me to visit them, or as having afforded information, for their courtesy and kindness. The third and concluding portion of my report will relate to fruit-growing.

William E. Bear.

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Notes, Communications, and Reviews.

THE QUALITY OF THE EXPERIMENTAL CORN CROPS GROWN AT WOBURN.

For the past twenty-one years, crops both of wheat and of barley have been grown year after year on the same land, and with the same manures applied year by year, on the Society's Experimental Farm at Woburn. The produce of corn and weight per bushel have been duly recorded throughout, but until this year there has been no attempt made to compare the produce of the different plots in respect of quality or market value. Following, however, the precedent of the Rothamsted Experimental Station, it was decided by the Chemical Committee to have the experimental wheat and barley crops valued by experts, and to deduce therefrom any conclusions that might be obtainable as to the influence which, over a period of so many years, any particular manure had exercised on the quality of the corn produced. With this view the services of Mr. Hewlins, of St. Ives, and Mr. Bingham, of Cambridge, were enlisted, the former having already done similar duty at Rothamsted. The corn crops of 1897, after being threshed in the field, and the corn subsequently winnowed and weighed, had been kept in the barn, the produce of each plot still separate. The corn was once more cleaned until obtained in the state in which it could be offered for sale; and, on May 17, 1898, Mr. Hewlins and Mr. Bingham came down to Woburn to inspect the several samples and to give their general observations on them and affix money values.

At the time of valuing, the price of corn of all kinds had received considerable impetus, on account of the war, but, seeing that our object was rather to compare on general grounds, and not as influenced by special and temporary circumstances, the produce of plots differently treated, the valuers adopted as their base of calculation the prices which the corn crop of the year might, under normal circumstances, be taken as being worth. The values adopted were 37*s*. per quarter for wheat and 34*s*. per quarter for barley. The variety of wheat grown was "White-chaff Browick" (a red wheat), and of barley "Golden Melon."

I.—Permanent Wheat.

Table I. gives the crop results and valuations assigned.

TABLE I.—*Permanent Wheat*, 1897. 21*st season.*

(Wheat grown year after year, on the same land, the manures being applied every year.)

Plot	Manures per acre	Produce per acre: Dressed corn: Bush	Dressed corn: Wght per bush	Tail corn: Wgt	Value per quarter	Remarks of valuers
			lb	lb	s d	
1	Unmanured	7 1	63 5	38	37 0	Better grown than plot 2, but not so strong
2	Ammonia salts (containing[1] 50 lb ammonia)	11 8	62 37	59	37 0	Stronger wheat than plot 1
3	Nitrate of soda (containing nitrogen=50 lb ammonia)	10 6	57 25	121	35 0	Worst of all plots
4	Mixed mineral manures[2] (sulphates of potash soda and magnesia, with superphosphate)	7 7	63 0	52	37 0	Very similar to 9b and nearly equal in strength
5	Mixed mineral manures and ammonia salts (containing 50 lb ammonia)	20 65	62 56	81	38 6	One of the best not quite so well grown as 8a
6	Mixed mineral manures and nitrate of soda (containing nitrogen=50 lb ammonia)	17 6	59 87	138	36 0	Worst of all except plot 3
7	Unmanured	7 7	62 75	31	37 0	Nearly as good as plot 1 possesses some bloom
8a	Mineral manures and (in alternate years 1897 included) ammonia salts (=100 lb ammonia) in addition	24 2	63 0	98	38 6	Best and strongest of all stronger than 8b, and a miller would prefer it to 8b
8b	Mineral manures, ammonia salts (=100 lb ammonia) omitted (in alternate years, including 1897)	16 4	63 75	56	38 6	Best grown of all and freest from light corn Not so strong as 8a, but would give more flour
9a	Mineral manures and (in alternate years, 1897 included) nitrate of soda (containing nitrogen=100 lb ammonia)	20 7	58 75	120	6 6	A strong wheat but low in produce of flour
9b	Mineral manures, nitrate of soda (=100 lb ammonia) omitted (in alternate years, including 1897)	9 8	63 0	46	37 0	Slightly preferable to plot 4
10a	1889, rape cake (=50 lb ammonia) No manure since	9 3	62 25	42	37 0	
10b	Rape cake (=100 lb ammonia) every year since 1890	22 4	61 62	90	36 6	A little better than plot 11b
11a	1877-81, farmyard manure (=200 lb ammonia) No manure since	8 6	62 25	42	36 6	About as good as 9a but rather better grown
11b	Farmyard manure (=200 lb ammonia) every year	16 0	61 25	92	36 6	

[1] Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.
[2] Mixed mineral manures are throughout 3½ cwt superphosphate of lime 200 lb sulphate of potash, 100 lb sulphate of soda, 100 lb sulphate of magnesia per acre

Arranging the produce of the various plots in the respective order of merit they might be thus grouped —

Above average . .	8a, 8b, 5
About " . .	10a, 9b, 4, 2, 1 and 7, 10 b.
Below " .	11a, 9a and 11b, 6, 3

As a whole, the wheat from the plots was of fair quality, and some, notably that from the plots manured with mineral manures and ammonia salts, was decidedly above the average. These were the best of all the series, and it is noticeable that there was but little difference of quality whether ammonia salts (the heavy dressing) had been applied in the year under notice (8a) or the year previous (8b). When a comparison was instituted between these plots manured with ammonia salts and those manured with nitrate of soda (3, 6, 9a, and 9b) a marked difference was found, the nitrate having produced the poorest quality samples of all, the corn being thin and shrivelled. Other noticeable features were the marked increase in the amount of tail corn in the plots manured with nitrate of soda, and the much lower weight per bushel of the dressed corn.

Nor was the wheat grown with farmyard manure (11b) of good quality, while that with rape cake (10b) was no better, both being inferior in quality to the unmanured crops (1 and 7), and to the crop treated with mineral manures only (4). The unmanured plots, it will be observed, gave the least offal corn.

The main points brought out are, therefore, the marked superiority of ammonia salts to nitrate of soda, the former producing a higher quality and good-weighted wheat, without excessive offal, while nitrate of soda has given a bad quality grain, of light weight, and containing much offal.

II.—Permanent Barley.

The crop results and valuations are given in Table II.

Of these samples it may be said at once that one and all were badly weathered, and, in consequence, inferior, the average for the year being in no case nearly reached. Under such circumstances it was hardly worth while differentiating closely between the several samples. The order of quality was :—

9b, 11b and 6, 11a; 4, 7 and 10 a, 8b
9 a, 8a, 10b, 5, 1, 3, 2.

Owing to the plots 2, 5, 8a, and 8b, manured with ammonia salts, having shown failure of plant through the impoverishment of the soil in lime, the weights of produce are not given. As compared, however, with the results obtained in the wheat crop, it would not seem that nitrate of soda produces with barley the marked deterioration in quality, weight of grain, etc., that it does with wheat, at least when mineral manures are used as well. Ammonia salts, on the other hand, would appear to have produced the worst quality samples, though, as remarked, this may be due to other causes. Mineral manures alone (plot 4) hold, as with wheat, an intermediate position, but farmyard manure (11b) stands high. A high proportion of offal is noticeable with the nitrate plots (3, 6, and 9a), as also with both farmyard manure (11b) and rape cake (10b). A

low weight per bushel was obtained by using nitrate of soda alone (plot 3), but when nitrate was used along with minerals this was not the case.

All these crops, however, had been exposed to rain for several weeks, and too much stress must not be put upon the results.

TABLE II.—*Permanent Barley*, 1897. 21*st season.*

(Barley grown year after year, on the same land, the manures being applied every year.)

Plot	Manures per acre	Produce per acre: Dressed corn, Bush.	Dressed corn, Wght. per bush.	Tail corn, Wgt.	Value per quarter		Remarks of valuers
			lb.	lb.	s.	d.	
1	Unmanured	5·6	51·75	11	26	0	
2	[1] Ammonia salts (containing 50 lb. ammonia) . .	?	50·75	30	23	0	
3	Nitrate of soda (containing nitrogen = 50 lb. ammonia)	21·0	50·87	54	24	0	
4	[2] Mixed mineral manures (sulphates of potash, soda, and magnesia, with superphosphate) . . .	10·2	52·12	25	27	6	
5	Mixed mineral manures and ammonia salts (containing 50 lb. ammonia) . .	?	53·0	31	27	0	
6	Mixed mineral manures and nitrate of soda (containing nitrogen = 50 lb. ammonia)	32·2	53·8	57	29	0	Best colour
7	Unmanured	6·9	52·5	27	27	6	
8a	Mineral manures and (in alternate years, 1897 included) ammonia salts (= 100 lb. ammonia) in addition . .	?	54·25	52	27	0	
8b	Mineral manures, ammonia salts (= 100 lb. ammonia) omitted (in alternate years including 1897) . .	?	54·25	46	27	0	
9a	Mineral manures and (in alternate years, 1897 included) nitrate of soda (containing nitrogen = 100 lb. ammonia)	34·9	53·25	122	27	0	
9b	Mineral manures, nitrate of soda (= 100 lb. ammonia) omitted (in alternate years, including 1897) . .	18·5	54·02	44	30	0	Best sample on the whole
10a	1859, rape cake (= 50 lb. ammonia). No manure since	9·0	52·75	72	27	6	
10b	Rapecake (= 100 lb. ammonia) every year since 1859 .	25·9	52·82	118	27	0	
11a	1877–81, farmyard manure (= 200 lb. ammonia). No manure since . . .	13·2	52·75	56	28	0	
11b	Farmyard manure (= 200 lb. ammonia) every year .	27·8	54·0	124	29	0	Next in value to 9b

[1] Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.

[2] Mixed mineral manures are, throughout, 3½ cwt. superphosphate of lime, 200 lb. sulphate of potash, 100 lb. sulphate of soda, 100 lb. sulphate of magnesia per acre.

III.—Rotation Wheat and Barley.

In addition to the permanent corn crops grown in Stackyard Field there were also, in the same field, crops of wheat and barley grown in rotation, the wheat after clover, and the barley after a root crop. These did not exhibit sufficient differences between individual plots as to call for detailed setting out; but it may be useful, as a comparison with the continuously grown crops, to say that the rotation wheat was, on the same basis, variously valued at from 36*s*. 6*d*. per quarter to 37*s*. 6*d*., and the valuers remarked that, as a whole, the wheat was composed of very large and well-grown grains, which, however, were yellow and weak. As to the rotation barley, all, as with the continuously grown samples, were poor and below average, being badly smutted. The values assigned ranged between 25*s*. and 28*s*. per quarter only.

IV.—Varieties of Barley and Kiln-Dried Barley.

In another field on the farm an experiment was tried in growing, for purposes of comparison, different varieties of barley, and of kiln-dried barley, as against the seed sown in the ordinary way. The respective values assigned were as follows :—

Variety	Seed not kiln-dried	Seed kiln-dried
	per quarter *s.*	per quarter *s. d.*
"Golden Melon"	30	31 0
"Chevalier"	29	31 0
"Californian Chevalier"	35	35 0
"Hallett's Pedigree"	32	32 6
"Oderbrück"	33	—
"Hanna"	32	—

The kiln-dried samples, it was noticed, had a finer and thinner skin; and, speaking generally, the kiln-drying of the seed before sowing resulted in an increased value of about 1*s*. a quarter. The "Californian Chevalier" did not show a difference in this respect, but it has to be remembered that the seed of this was originally drier than that of the other varieties.

J. Augustus Voelcker.

13 Hanover Square, W.

CHANGES IN MANGELS DURING STORAGE.

Mangels are generally considered by farmers to be more valuable as food for stock after Christmas than during the autumn, but the exact reason of this has never been worked out. During the winter of 1896–7 analyses of mangels were conducted in the Laboratory at Cambridge once a month from October to April, and it was noticed that in October the amount of nitrogen in the roots in the form of nitrates was very large, but that the amount of this form of nitrogen rapidly decreased, and by Christmas had fallen to about

one-third of its original amount. A short statement giving these results was published in *Nature* in August 1897, and the analyses were repeated during the winter of 1897–8 on a more extended scale. The mangels used were grown on a light soil in Norfolk, and six roots of the uniform weight of as nearly as possible five pounds each were taken for each analysis. These roots were reduced to pulp, their juice obtained by pressure, and analysed at once, so as to avoid all chance of change in composition by fermentation.

The nitrogen present as nitrates was estimated by Schlösing's method; the ammoniacal nitrogen by distilling with magnesia; the albuminoid nitrogen by precipitating the albuminoids by lactic acid and determining the nitrogen in the precipitate; the peptone nitrogen by precipitation with phosphotungstic acid after removal of albuminoids and ammonia as above; the amides by hydrolysis with five per cent. sulphuric acid and subsequent distillation with magnesia. The analytical numbers are given in the subjoined table:—

PERCENTAGES IN JUICE OF NITROGEN IN THE FORM OF

Date of analysis	Ammonia	Nitrates	Amides	Albuminoids	Peptones	Total
Nov. 1, 1897 .	·021	·043	·044	·036	·015	·159
Jan. 15, 1898 .	·019	·020	·062	·036	·019	·156
March 7, 1898 .	·023	·025	·089	·044	·022	·203
May 1, 1898 .	·017	·024	·081	·046	·021	·189

It is noticeable that the percentage of nitrogen as nitrate decreases during storage, while the albuminoid, and more particularly the amide nitrogen, increases. This is more clearly shown by the following table, in which the percentage of the total nitrogen in the juice present in each form is calculated from the above numbers:—

PERCENTAGE OF TOTAL NITROGEN PRESENT AS

Date of analysis	Ammonia	Nitrates	Amides	Albuminoids	Peptones
Nov. 1, 1897 .	13	27	28	22	10
Jan. 15, 1898 .	12	13	40	23	12
Mar. 7, 1898 .	11	13	43	22	11
May 1, 1898 .	9	13	43	24	11

From the above numbers it appears that mangels, soon after they are pulled, contain a large proportion of their nitrogen in the form of nitrates, a form in which it is of no use to stock for feeding purposes, but rather the reverse. By January 15 the proportion of nitrogen present as nitrate has fallen to less than half its original amount; and this fall in nitrate is counterbalanced by a large rise in the proportion of amide nitrogen, which is, at any rate, not harmful. The amount of nitrogen as ammonia decreases only very slightly, while the albuminoids and peptones slowly increase.

An explanation is thus found for the improvement of mangels on keeping. In the early autumn they are full of nitrates, which are liable to cause derangements in digestion; by January these nitrates have been changed into amides, which have some feeding value and are quite harmless. There has also been a slight increase in the albuminoids and peptones, which are, of course, of the highest feeding value.

T. B. Wood.

University Chemical Laboratory, Cambridge.

THE USE OF WIND AND STEAM POWER COMBINED IN RURAL WATER SUPPLIES.

In proportion as it has become more generally known that some of the most dangerous of the preventable diseases are directly traceable to polluted water, and that even where such serious results are not brought about, yet a generally lowered system of vitality is invariably produced by the same cause, so is the urgent necessity of a pure and plentiful water supply more fully recognised. The difficulties which surround its provision in rural districts and villages are in many cases very considerable, and occasionally so much so as to be almost prohibitive. It has been thought that a short account—somewhat imperfect from circumstances not under the writer's control—of a successful and inexpensive scheme which has recently been carried out on the estate of the Earl of Yarborough, Brocklesby Park, Lincolnshire, may be of use and interest to some who may be contemplating the provision of a water supply.

An ably written and interesting article recently appeared in the Journal,[1] which gave a description of a scheme carried out on Earl Spencer's estate in Northamptonshire, the general circumstances of the area to be supplied being not unlike those given below. The population does not differ to any great extent; in both cases the areas are country parishes,—parts of large estates; and lastly, in neither case does there exist any natural stream from which water could be stored up and distributed as required.

On Earl Spencer's estate, commencing *de novo* as it were, wind power and that alone, with large storage capacity, was selected as the motive power. In the present case, wind power, which already existed, and steam power combined, with a small and inexpensive storage reservoir, are the motive powers, the latter being only supplementary in case of the failure of the former. A comparison between the merits—or possibly in some cases the demerits—of these two schemes may be of interest, and with this motive the present paper has been written.

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[1] "The Use of Wind Power in Village Water Supply." By A. L. Y. Morley. Journal R A S.E, 3rd Series, Vol. VIII, 1897, p 233.

The parish of Great Limber lies on the wolds of North Lincolnshire, the whole of it, with the exception of a small acreage of glebe land, being the property of the Earl of Yarborough. At the census of 1891 the population was 530, and it is not thought that there has since been any material alteration. Deducting some few outlying houses which are otherwise provided for, there remained from 470 to 480 persons for whom a good and plentiful water supply was urgently needed. The existing supply was not only very deficient in quantity, but analysis showed that it was of such a quality as should not in any case be used for domestic purposes. It was procured from two shallow wells at a very considerable distance from many of the houses, and was conveyed thither by the cottagers themselves, principally in small hand water-carts, entailing much labour and trouble, and very materially increasing the difficulties of keeping themselves and their houses in a cleanly and healthy condition. The principal private houses were supplied from wells dug out of the chalk at an average depth of about 100 feet. The matter having frequently been before the District Council, Mr. Villiers, water engineer, of Beverley, was called in to advise as to the best steps to be taken. In February last, at a meeting of the Parish Council, a scheme was submitted by the Earl of Yarborough's agent, with the terms on which would depend its carrying out and future maintenance. It was determined to accept his Lordship's offer to provide a water supply, and this has now been successfully put into operation.

There was in existence, as has been already said, a wind engine situated on a farm in the higher parts of the parish, occupied by Mr. Frankish, raising water from a well 200 feet deep, cut out of the chalk rock, into an iron tank containing about 2,500 gallons, for the supply of the farmstead and three cottages. The analysis of this water proved to be most satisfactory, and was as follows :—

Total Residue, grains per gall.	Chlorine, grains per gall.	Free Ammonia, parts per million	Albm. Ammonia, parts per million	Temporary Hardness	Permanent Hardness
17·20	1·32	·0106	·0240	11·8	2·0

"A water of a very high degree of purity, and admirably suited for a public water supply," was the report of Mr. Jas. Baynes, Public Analyst.

The height above sea level at this point is 210 feet. It was found, on levels being taken, that with adequate storage water could be carried by gravitation to the most distant houses and farms. To supply the amount needed entire reliance could not be placed on the wind engine alone—one of an 1891 pattern; it was therefore decided to erect a small steam engine to provide for the work being done in case of the failure of the wind power. This is a 4-horse-power vertical engine, made by Messrs.

Foster & Co., of Lincoln, at a cost of £78. 11*s*. 6*d*., having two cranks on the shaft and working at from 40 to 45 lb. pressure, consuming 18 stone of coal per day. It is enclosed in a corrugated iron shed, erected at a cost of £16. The water is first pumped into an elevated iron tank, so as to secure a supply for the farmstead and cottages, and then is passed into a reservoir. This measures 41 ft. × 15 ft. × 6 ft., is built of bricks rendered in cement, is mainly within the ground level, and contains about 24,000 gallons. The work of excavating, which was from the solid chalk rock, was let by contract at 1*s*. per cubic yard, and 16,000 bricks were used in the construction. A pipe regulated by stop cock is passed round the outer side of the reservoir and enters the main at the lower end, for the purpose of providing the usual supply in case of the necessity of cleansing or repairing the tank. From this point the water is conveyed 2,376 yards to the centre of the village, in 2-in. cast-iron pipes, coated with Dr. Angus Smith's solution, lead-jointed, weighing 28 lb. per yard and tested up to 200 lb. pressure. The cost of these pipes is 1*s*. 4½*d*. per yard. The height above sea level here is 133 feet, showing a fall of 71 feet. From here the water is carried in 1½-in. wrought-iron pipes, screw jointed, coated and tested as above, and also at a cost of 1*s*. 4½*d*. per yard. For the remainder of the work 1¼-in. and ¾-in. pipes are used, the former being employed to reach the most distant farm, Limber Grange, 3,586 yards away.

The writer is informed that much adverse criticism was passed as to the small diameter of the pipes, as compared with other systems of which the particulars were known. The satisfactory results have however, amply justified the expectations of its promoters, as at the farm mentioned above, 3¼ miles from the reservoir, at 164 feet above sea level—and so rising 33 feet from the centre of the village, where the 2-in. pipes are discontinued—an ample supply is secured not only for 10 houses, but also for the farm stock and other agricultural purposes.

The lengths in which the various-sized pipes are used is as follows:—2-in., from the reservoir, 2,376 yds.; 1½-in. 726 yds.; 1¼-in., in three branches, respectively 264 yds., 3,586 yds., and 1,716 yds.; ¾-in., in various branches, supplying some private houses, outlying cottages, &c., making up about 850 yds. The whole length of piping in use therefore is nearly 5½ miles. The work of digging—mainly in chalk—and re-filling the trenches, and of watching and lighting them, was contracted for at 4*s*. 6*d*. per chain.

The stand-pipes selected are those of Messrs. E. & H. Roberts, Deanshanger, at a cost of £2. 13*s*. 6*d*. each. The lever by which the water is drawn closes automatically by its own weight, by which means waste from carelessness or other causes is prevented. To avoid the inconvenience and damage caused by frozen pipes, they are provided with a self-acting valve which closes the junction with the main after each withdrawal of water, and the small amount left in the vertical pipe is allowed to run to waste, and for

this some additional drainage arrangement is provided at each stand-pipe, at a cost of 5*s.* 6*d.* Fourteen of these are distributed about at convenient points, so that all the cottagers have now a good supply almost at their doors, a boon for which they are most thankful. Stop-cocks are inserted near each stand-pipe in case of any repairs being required. Connections are made with eight private houses or shops into tanks with ball valves, the cost of such tanks being provided by the occupiers.

The total outlay on this work amounts roughly to about £1,180, a most satisfactory conclusion, considering the inestimable benefits conferred. This sum includes the wind engine, which has been taken over by Lord Yarborough, but of course does not embrace the original cost of digging the well, which, as has been said, was already in existence at the farmstead, for which it was in the first instance exclusively made.

To provide for working expenses and interest on the principal expended, the land is rated by agreement at 4*d.* per acre, and cottages which are not let with the farms are charged 2*s.* per annum. This, with the contribution of £1. 10*s.* for the vicarage connection, produces £63. 4*s.* 10*d.* per annum. All repairs and renewals are guaranteed by the Earl of Yarborough, and at present an annual sum of £10 is allowed for the superintendence of the wind engine and for the cost of working the steam engine when required, but as the demands upon the water have been so materially increased from the original scheme by its extended use for various farm purposes, it is not thought likely that this amount will suffice for working expenses in the future. It is impossible at present to say what these will reach, as no data have so far been kept of the number of days in which resort had to be made to the steam engine. It would not, therefore, perhaps be correct in this case to state simply that the sum of £10 represents truly the annual working expenses. In the selection of any scheme for a water supply, local circumstances must mainly determine what is the motive power to be adopted, but in comparisons which may be drawn between the present arrangement and any other where wind power can be entirely relied upon this annual charge becomes a matter of considerable importance.

In any circumstances it will be conceded that a most useful and—from the point of the health of the community—a most beneficial work has been carried out at a comparatively small outlay. Water has been described as the prime necessity of life, and this has been brought to every man's door in Great Limber. Much credit is due to Mr. Holmes, Clerk of Works on the Brocklesby Estate, who has taken great personal interest in the scheme, and to whose energy and ability its successful issue may very largely be attributed.

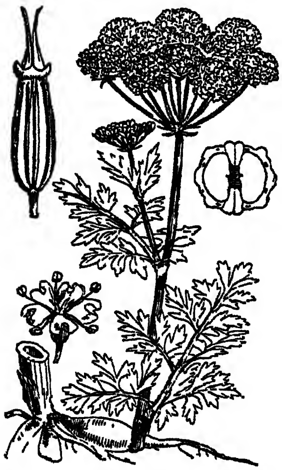
SEPTIMUS P. SKIPWORTH.

Owmby Mount. Lincolnshire.

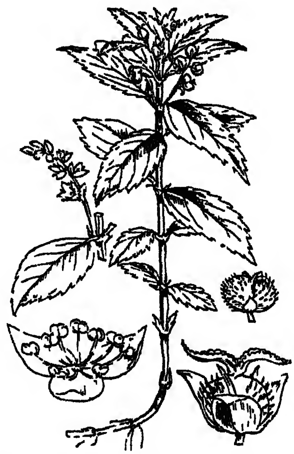
TWO POISONOUS PLANTS.[1]

On a farm near Bristol several sheep and cattle were lost in the summer from the attack of an unknown malady. The cattle suffered from stupor and convulsions, which ended in death. There were found in the ditches around the field some plants of *Œnanthe crocata*, Linn., an active poisonous plant. It belongs to the Order *Umbelliferæ*; has a tall growing, frequently branching stem, and thick fibrous root with yellow or colourless juice. The leaves are very much divided, the last divisions being wedge-shaped, lobed, and sometimes rounded at the broad apices. The flowers are white, and the fruits are long, narrow, and beaked.

This plant is well known to be poisonous, and the symptoms



Œnanthe crocata, Linn. Water Dropwort.



Mercurialis perennis, Linn. Dog's Mercury.

observed in the cattle that died agree with what had been observed in previous cases of eating this plant. It is popularly called water-dropwort or water-hemlock.

Stock accustomed to the vegetation of the meadows where this plant grows would learn to avoid it, and this, no doubt, accounts for the immunity of the stock in some of the neighbouring pastures, and even in this pasture before the present season. Strange stock would be more likely, in their ignorance, to eat the dropwort.

This plant should be cleared out of the ditches around the fields where cattle are pastured, and wherever the stock can get access to it.

On a farm in Yorkshire three valuable horses had been attacked with a malady which was very speedily fatal. One attacked on

[1] The two illustrations to this note are reproduced from *Illustrations of the British Flora*, by kind permission of the publishers, Messrs. L. Reeve & Co.

Saturday night had died early the following morning; the second was seized on Sunday night and died on Monday night; the third was seized on Monday morning, and after being very ill it seemed to recover somewhat on the Wednesday, but then had a relapse and died. The horses were in the house, and were being fed with grass cut from the sides of the carriage-drive. Samples of this grass were found to contain a large amount of Dog's Mercury (*Mercurialis perennis*, Linn.). This plant belongs to the *Euphorbiaceæ*, a well-known dangerous family, and this particular plant has been noted frequently as causing fatal results. Four years ago Mr. J. B. Carruthers recorded a case that happened at that time at Aldworth. A farmer gave his horses some herbage cut from a hedgerow. This contained some dog's mercury, and though a veterinary surgeon was called in, five horses died.

Mercurialis perennis, Linn. is a perennial plant growing from eight to twelve inches high. Its ovate leaves are mostly confined to the upper part of the stem, and the inconspicuous yellowish-green flowers spring from the axils of the leaves. The sexes are on different plants. The plant flourishes in woody and shady places. It is shunned by all animals in the places where it is growing, but when it is offered in the house it is not so easily avoided. I know of its being dangerous only when it is supplied in the house.

WM. CARRUTHERS.

44 Central Hill, Norwood, S.E.

THE AGRICULTURAL HOLDINGS ACT, 1883.

Determination of Tenancy.

In the case of *Morley* v. *Carter* [1] the question, What is "the determination of the tenancy" within the meaning of the 7th Section of this Act? again came up for decision, notwithstanding the previous decisions on the same words in the case of *Re Paul*, which is noted in vol. v. of the present series of the Journal (1894) at p. 564, and on the corresponding words in the Scotch Act, in the case of *Black* v. *Clay*, which is noted in vol. i. of the same series (1890) at p. 204. The facts of the case were as follow:—

Morley was the tenant and Carter was the landlord of a farm and buildings under a contract of tenancy which provided that, on due notice to quit being given, the land included in the holding should be given up on the 2nd day of February and the buildings on the 1st day of May in any year. The tenant, in June 1896, gave a notice (which was admitted to be in order) that he would quit the holding on February 2, 1897, and on that day he quitted the land; he remained in possession of the buildings until May 1, 1897, when he gave them up. On February 26, 1897, he gave notice to the landlord that he intended to claim compensation under the Act.

[1] This report is from the *Solicitors' Journal.*

On April 29 he gave notice to the landlord that he had appointed a person to act as referee to assess the compensation, and required the landlord to appoint a referee on his behalf. The landlord did not appoint a referee, and on June 14 the tenant applied, pursuant to a summons, to the county court to appoint a referee. The application was by consent heard by the registrar. Section 7 of the Act provides that notice of an intention to claim compensation must be given by the tenant to the landlord "two months at least before the determination of the tenancy." Section 9 (6) requires the county court to appoint a referee if for fourteen days after notice by one party to the other to appoint a referee the other party fails to do so. The registrar refused to make the order on the ground that the tenancy was determined on February 2, 1897, and that the notice of claim not having been given two months prior to that date the provisions of section 9 as to the appointment of a referee did not apply. The tenant appealed to the Queen's Bench Division of the High Court, and contended that the tenancy was not determined until May 1, when the buildings were given up, and that the notice of claim was therefore given in time. But the court, which consisted of Justices Wright and Kennedy, were adverse to this contention, and dismissed the appeal.

In giving judgment, *Mr. Justice Wright* is reported to have said :—

Having regard to the Scotch case (*Black* v. *Clay*), I think there is no real doubt in this case. The substance of the matter is this : Section 1 of the Act says that a tenant shall be entitled "on quitting his holding on the determination of a tenancy" to obtain compensation for certain improvements. By Section 54 the Act is not to apply to a holding that is not either wholly agricultural or wholly pastoral or in part agricultural and as to the residue pastoral ; and Section 61 says that "'holding' means any parcel of land held by a tenant." The Act, therefore, contemplates compensation being given in respect of an agricultural or pastoral holding on the determination of the tenancy of such a holding. On February 26, when this notice was given, there was no tenancy of an agricultural holding ; the time within which notice of a claim under the Act could be given expired two months before February 2. This view is strongly confirmed by the case of *Black* v. *Clay*. And *Re Paul*, as I read it, was decided on the ground that the tenant had retained 200 acres of agricultural land, and that, therefore, his tenancy still subsisted.

And, *Mr. Justice Kennedy* agreeing, the appeal was dismissed.

S. B. L. Druce.

Lincoln's Inn.

THE SUMMER OF 1898.

THE summer of 1898 opened with cool, changeable weather, but improved steadily as time went on, the latter half of the season being mostly fair, warm, and extremely dry. In the west and north, however, the conditions were far less settled than in the east and south, and even in the latter districts the weather underwent local modifications, the effect of which was seen in the varying quality of the harvest, even in fairly adjacent places.

Coming as it did after a long spell of dry weather, broken only by the heavy rains of May, the deficiency of rain in July and August resulted in a great scarcity of water in many parts of our eastern and southern counties. In the East end of London, where the storage capacity had been allowed to fall below the requirements of an increasing population, the effect of the drought was felt in a very serious degree, and at the close of the summer the gradual reduction in the water supply was occasioning great anxiety. Over the south-eastern parts of the country the summer thunderstorms appear to have been somewhat infrequent, and as a rule of little severity. In the west and north, however, there were occasional storms of great violence, the worst of all being experienced on August 17 and 18 over an area comprising nearly the whole of South Wales, the South-West of England, and the South of Ireland. The counties of Devon and Cornwall were also affected seriously by heavy thunderstorms on June 12, and on each occasion much damage was caused either by lightning or by torrential falls of rain and hail.

The leading features in the weather of the recent summer are shown in a statistical form on p. 565, the following remarks giving further details of interest in the history of each particular element.

Temperature.—During the earlier half of the summer the mean temperature was mostly below the average, a slight excess being reported, however, in the second and fourth weeks of June. In the latter half of the season the readings were as a rule either equal to, or above, the average, the excess being greatest in the third week of August. Over our eastern and south-eastern counties the spell of heat which then set in was preceded by a brief touch of very cool, wet weather, and on the 7th the maximum temperature in London (54°) was the lowest observed in August for more than a quarter of a century. Taking the summer as a whole the mean temperature over England showed no very wide departure from the average. In the south-western district and in the Channel Islands there was a slight excess, due exclusively to warmth in the daytime, but in most other parts there was an equally slight deficiency. In the eastern and north-western counties the deficiency was common to both day and night readings, but in the midland and north-eastern districts there was a slight excess of warmth in the daytime and a deficiency at night, the latter feature being somewhat pronounced in the north-east. A comparison with previous years

Temperature, Rainfall, *and* **Bright Sunshine** *experienced over* **England** *and* **Wales** *during the Thirteen Weeks ended August* 27, 1898.

(*The Summer Season.*)

Districts	Temperature: Highest observed	Temperature: Lowest observed	Day temperatures: Mean	Day temperatures: Difference from average	Night temperatures: Mean	Night temperatures: Difference from average	Day and night temperatures combined: Mean	Day and night temperatures combined: Difference from average
	°	°	°	°	°	°	°	°
North-eastern counties	83	34	65·0	+0·6	49 6	−1·4	57·3	−0 4
Eastern counties	87	37	67·6	−0·6	50·8	−0·3	59·2	−0·5
Midland „	85	32	68·3	+0 1	49·7	−0 5	59·0	−0·2
Southern „	89	36	68·1	−0·1	53·0	0·0	60·6	0 0
North-western counties, including North Wales	81	36	64·7	−0·4	51·7	−0·3	58·2	−0 4
South-western counties, including South Wales	83	34	66·5	+1·1	52·5	0 0	59·5	+0·5
Channel Islands	83	45	66·4	+0·9	55·5	0 0	61·0	+0 5

Districts	Rainfall: Days with rain: Number	Rainfall: Days with rain: Difference from average	Rainfall: Total fall: Amount	Rainfall: Total fall: Proportion of average amount	Bright Sunshine: Duration: Hours recorded	Bright Sunshine: Duration: Difference from average	Bright Sunshine: Percentage of possible amount: Percentage	Bright Sunshine: Percentage of possible amount: Difference from average percentage
			ins.	per cent.				
North-eastern counties	40	− 3	4·9	69	472	+ 3	32	0
Eastern counties	35	− 7	5·8	80	548	−40	38	−3
Midland „	36	− 7	5 3	70	544	+34	38	+2
Southern „	29	−11	3 5	51	569	−20	40	−2
North-western counties, including North Wales	43	− 3	8·3	94	543	+27	37	+2
South-western counties, including South Wales	33	−14	6 3	70	646	+30	46	+2
Channel Islands	38	− 8	4·7	71	768	+89	55	+6

NOTE.—The above Table is compiled from information given in the Weekly Weather Report of the Meteorological Office. The averages employed are: For Temperature, the records made during the twenty-five years, 1871–95; for Rainy Days, the values for the fifteen years, 1881–95; for Total Rainfall, those for the thirty years, 1866–95; and for Bright Sunshine, those for the fifteen years, 1881–95.

shows that over the country generally the summer was not so warm as in 1897 or 1896, and in the south-western district it was less warm than in 1895. In all places, however, it was decidedly warmer than in 1894. The highest temperatures of last summer occurred in August, either between the 11th and 15th or on the 22nd. On each of these occasions the shade readings were above 80° in most parts of the country, the highest of all being on August 22, when the thermometer rose to 87° at Hillington and Cambridge, and to 89° in London. In the western and northern districts the thermometer exceeded 80° at no other time during the summer, but at some of the eastern and southern stations it rose above that level about July 15 or 16, the highest reading being 85° at Southampton. Over the country generally the highest summer temperatures were lower than in 1897 or 1896, but in most districts they were higher than in 1895. In June 1897 the thermometer touched 90° in several parts of the eastern, midland, and southern counties. The lowest temperatures of the season occurred as a rule on June 1, when the sheltered thermometer fell in most districts to between 34° and 37°. In the midland counties, however, and also in the south-western district and the Channel Islands, the lowest readings were observed on June 15, the sheltered thermometer on this occasion falling as low as the freezing point in some parts of the midlands. At Loughborough an instrument fully exposed on the grass registered three degrees of frost. At various times in July—but mainly about the 20th or 30th—the night temperatures were again low for the time of year, the exposed thermometer at Hillington sinking on the former occasion to within a degree of the freezing point. The absolute minima for the entire season appear to have been lower than in the summer of 1897 or 1896, but not so low as in 1895, when a very sharp ground frost occurred about the middle of June.

Rainfall.—In June the amount of rainfall varied greatly in different localities, a deficiency being reported in most places, but an excess in several parts of our eastern and south-western counties. In the former district the excess was due exclusively to a very heavy fall which occurred on the 9th. Throughout the remainder of the season there was an almost constant deficiency, the only important exception occurring during the first and second weeks in August, when the amount was in most cases in excess of the average. During the first and second weeks in July scarcely a drop of rain fell in any part of the country, and at many of the western stations the total amount for the whole of that month was the smallest recorded for at least twenty-five years past. Taking the summer as a whole, there was in most districts a large falling off, not only in the aggregate amount, but in the frequency of rain, the only district in which the conditions were anywhere near the normal being the north-western counties. In this region the total fall was only 6 per cent. less than the average, but in all other districts it was at least 20 per cent. less, and in the midlands, as well as in the north-eastern and the south-western counties and the Channel Islands, about 30 per cent. less. By far the driest part of the country was, however, the

southern district, comprising all counties east of Dorsetshire and south of Berkshire. In this area the total rainfall was only 51 per cent., or scarcely more than half the average, the summer being in some places scarcely so dry as that of 1885, but in others the driest for at least twenty-five or thirty years past. In London, where the drought appears to have reached its maximum severity, the total rainfall for the whole of the three months June to August was less than $2\frac{3}{4}$ inches, or only 39 per cent. of the average, and smaller than in any summer since that of 1818. In the driest of the very long series of intervening years, viz. 1869, the summer rainfall in London amounted to quite half an inch more than that recorded this year. The infrequency of rain last summer is shown very clearly by the first and second columns in the lower part of the table on p. 565. In the northern parts of the country the number of days with rain was not appreciably below the average, but in all other districts, and especially in the southern and south-western, it was very far short of the normal and much smaller than in any recent summer. In so dry a season as that of 1898 the occurrence of individual heavy falls of rain was naturally somewhat rare. The most important and widespread cases were reported on the following dates :—(1) On June 9, in the eastern and extreme south-eastern parts of the country, when as much as 2·1 inches fell at Bury St. Edmunds, 1·8 inch at Norwich, and 1·7 inch at Yarmouth. (2) On July 22, in Wales and the west and north of England, the amount being as much as 2·2 inches at Bawtry (North Notts) and Aberystwyth, and 1·6 inch at York. (3) On August 6, in several parts of the country, when 1·2 inch fell at Stamford, Clifton, and Cirencester. (4) On August 9, in the north-western parts of the country, the largest amounts being 1·6 inch at Stonyhurst, and 1·5 inch at Douglas (Isle of Man); and (5) on August 17 or 18, over South Wales and the south-west of England, when 1·4 inch fell at Plymouth, and 1·1 inch at Prawle Point and Llandovery (Caermarthenshire). In most of these cases the heavy rainfall occurred during the prevalence of severe thunderstorms, but on June 9 there was no electrical disturbance, the downpour being occasioned by a small cyclonic system which advanced from the southward over France and the Netherlands.

Bright Sunshine.—The prevalence of this very important element varied greatly from time to time, and in different parts of the country, but was mostly deficient in June and in excess of the average in July and August. Taking the summer as a whole the amount was considerably below the average in the eastern, and slightly below it in the southern counties, but above it in all other districts. As a rule the excess was not large, but in the Channel Islands the mean daily allowance for the entire season was nearly an hour more than the average. With the exception of this locality the amount of sunshine was much less than in the summer of 1897, and in many districts less than in 1896 or in 1895. It was, however, greater than in 1894, when a large deficiency was reported over nearly the whole country.

CROPS AND LIVE-STOCK IN 1897.

PRELIMINARY portions of the Agricultural Returns for the year 1897 have appeared in tabular form in the Journal, at pp. 574 and 786 of last year's volume (1897), and at p. 210 of this volume (Part I.). These, with other data, are embodied in the Summary Table given herewith at pp. 570–71, which is compiled from the complete Returns[1] that were published on June 30, 1898, coincidently with the appearance of the preceding number (Part II.) of this volume of the Journal. This summary table may be consulted in conjunction with the following statements derived from Major Craigie's report prefixed to the official volume.

TOTAL PRODUCE OF CROPS IN THE UNITED KINGDOM IN 1897.

The estimated total produce of the three great cereals of the United Kingdom ranged in the order of their relative bulk is shown in Table I. The oat crop, to which Scotland and Ireland so largely contribute, indicates slightly greater abundance than in 1896, but falls below the total for 1895. Barley was secured in distinctly less quantity than in 1896, while the wheat crop, notwithstanding the added acreage, did not reach in bulk the aggregate obtained in the previous season, when the yield per acre was so much more generally bountiful. The remarkable diminution in potatoes, occurring both in Great Britain and in Ireland, appears prominently in this table, as well as the great addition to the hay crop of the United Kingdom secured in 1897.

TABLE I.—*Estimated Total Produce of Crops in the United Kingdom.*

Crops	1895	1896	1897
	quarters	quarters	quarters
Oats	21,810,000	20,357,000	20,445,000
Barley	9,379,000	9,728,000	9,077,000
Wheat	4,786,000	7,281,000	7,037,000
	tons	tons	tons
Potatoes	7,065,000	6,263,000	4,107,000
Turnips	29,221,000	28,037,000	29,785,000
Mangel	6,376,000	5,875,000	7,379,000
Hay (all sorts)	12,238,000	11,416,000	14,043,000

YIELD OF CROPS IN GREAT BRITAIN.

Referring now to the area of Great Britain alone, the varying yields per acre of the past and previous years may be contrasted as in Table II., wherein the average of the estimated yields of wheat, barley, oats, potatoes, and hay over the whole ten years, 1887 to

[1] *Agricultural Returns for Great Britain, showing the Acreage and Produce of Crops, Prices of Corn, and number of Live Stock, with Agricultural Statistics for the United Kingdom, British Possessions, and Foreign Countries,* 1897. [C.—8897]. Pp. lii. + 258. London: Eyre & Spottiswoode. 1*s.* 6*d.*

1896 inclusive, is represented by the figure 100 in each case, and the relative character of the annual harvests of Great Britain over this period is shown in relation to this standard.

TABLE II.—*Comparison of Estimated Yields per Acre for* 1897 *in Great Britain with Estimated Yields of former Years.*

Year	WHEAT	BARLEY	OATS	POTATOES	HAY (Clover)	HAY (Permanent grass)
	Average 1887–96, 29·49 bushels per acre =100	Average 1887–96, 32·82 bushels per acre =100	Average 1887–96, 38·13 bushels per acre =100	Average 1887–96, 5·97 tons per acre =100	Average 1887–96, 27·55 cwts. per acre =100	Average 1887–96, 22·53 cwts. per acre =100
1887	109	95	91	107	99	92
1888	95	100	98	87	102	125
1889	101	97	103	104	121	130
1890	104	107	109	89	111	118
1891	106	104	102	96	103	104
1892	89	105	102	97	93	85
1893	88	87	93	110	68	56
1894	104	105	109	93	118	127
1895	89	97	97	111	98	85
1896	114	102	97	106	88	78
1897	99	100	101	87	105	111

Wheat in 1897 thus falls slightly under the average yield of the ten preceding years, and barley is exactly an average, while oats only exceed that average by a matter of one per cent. Potatoes represent the worst crop of the year, but both forms of hay give considerably over average results. The very large difference which an enhanced or reduced yield of hay per acre represents to the stock owners of Great Britain can, however, be best appreciated from the fact that in the period of 11 years ending with 1897 the total estimated annual produce ranged between a maximum of 228,617,560 cwt. in 1889, and a minimum of 91,976,022 cwt. in 1893.

Estimated Yield of Wheat in Great Britain.—The average yield of wheat per acre just exceeded 29 bushels, as compared with 33·68 bushels in 1896 and with 29·49 bushels on the average of the years 1887–96 inclusive. But an examination of the county averages would show considerable variations in the local experiences of the past year, the results of varying climatic conditions. Lincolnshire, among the great English wheat-growing counties, with an area of wheat exceeding 174,000 acres, reports an average yield of nearly 33 bushels per acre, but Norfolk and Cambridge with less than 30, and Essex and Nottingham with only 27 and 26 bushels per acre respectively, are well below a ten years' average.

Estimated Yield of Barley and Oats in Great Britain.—Of barley the highest average yields were apparently in the North and in Scotland, the crop of Durham being between 5 and 6 bushels over average, and that of Aberdeen between 4 and 5

Estimated Total Produce and Yield per Acre of the* Principal Crops, Cattle, Sheep, *and* Pigs, *in the United

[Compiled from the

Crops	England						Wales					
	Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre		Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre	
	1896	1897	1896	1897	1896	1897	1896	1897	1896	1897	1896	1897
CORN CROPS:—	Acres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bush.	Bush.
Wheat	1,600	1,786	54,523	51,725	33·88	28·97	47	54	1,078	1,332	22·95	24·76
Barley, including Bere	1,779	1,698	59,844	55,159	33·64	32·48	108	104	2,823	3,116	26·21	29·86
Oats	1,846	1,829	69,402	73,639	37·60	40·26	242	239	7,180	7,766	29·71	32·56
Beans	237	214	5,974	6,123	25·27	28·71	1	1	31	30	20·68	20·74
Peas	194	187	4,912	5,168	25·40	27·64	2	2	26	35	16·64	20·35
TOTAL CORN CROPS (including Rye)	5,729	5,781	—	—	—	—	401	402	—	—	—	—
GREEN CROPS:—			Tons	Tons	Tons	Tons			Tons	Tons	Tons	Tons
Potatoes	400	352	2,539	1,896	6·35	5·38	34	33	218	166	6·45	5·10
Turnips, including Swedes	1,337	1,288	14,656	17,106	10·96	13·28	71	70	957	1,114	13·47	15·84
Mangel	329	345	4,968	6,480	15·10	18·76	7	8	99	126	13·28	16·07
Cabbage, Kohl-rabi, and Rape	148	151	—	—	—	—	3	3	—	—	—	—
Vetches or Tares	166	187	—	—	—	—	2	2	—	—	—	—
Other Green Crops	130	127	—	—	—	—	1	1	—	—	—	—
TOTAL GREEN CROPS	2,511	2,450	—	—	—	—	118	117	—	—	—	—
OTHER CROPS, GRASS, &c.:—			Cwt.	Cwt.	Cwt.	Cwt.			Cwt.	Cwt.		
Clover and artificial grasses and permanent pasture	10,492	10,483	—	—	—	—	1,627	1,634	—	—	—	—
Ditto for hay	5,560	5,594	105,800	147,930	—	—	678	670	9,726	14,529	—	—
Flax	2	1	—	—	—	—	—	—	—	—	—	—
Hops	54	51	453	411	8·36	8·08	—	—	—	—	—	—
Small Fruit[3]	70	64	—	—	—	—	1	1	—	—	—	—
TOTAL OTHER CROPS	16,177	16,193	—	—	—	—	2,306	2,305	—	—	—	—

Live Stock	Year 1896	Year 1897	Year 1896	Year 1897
	Actual No.	Actual No.	Actual No.	Actual No.
Horses	1,193,038	1,165,763	155,965	153,282
Cattle	4,573,603	4,567,834	712,979	709,120
Sheep	16,031,095	15,721,216	3,207,815	3,195,359
Pigs	2,476,488	1,990,534	257,638	216,447

NOTE.—The produce of Corn Crops for Ireland, originally returned in weight, has been converted into *bushels* at the rate of 60 *lb.* to the bushel of Wheat; 50 *lb.* to the bushel of Barley; 39 *lb* to the bushel of Oats; and 60 *lb.* to the bushel of Beans and Peas.

and also the Acreage under Other Crops *and* Grass, *and Numbers of* Horses,
Kingdom in the Years 1896 *and* 1897.
Agricultural Returns.]

Scotland						Ireland						United Kingdom[4]					
Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre		Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre		Acreage, 'thousands' (000) omitted		Produce of crops, 'thousands' (000) omitted		Average yield per acre	
1896	1897	1896	1897	1896	1897	1896	1897	1896	1897	1896	1897	1896	1897	1896	1897	1896	1897
Acres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bush.	Bush.	Acres	Acres	Bush.	Bush.	Bush	Bush
38	50	1,452	1,883	38·47	37·83	38	47	1,194	1,355	31·41	28·69	1,734	1,939	58,247	56,296	33·63	29·07
218	233	8,108	8,539	37·14	36·63	173	171	7,050	5,799	40·65	33·98	2,286	2,214	77,825	72,613	34·16	32·91
1,008	968	37,434	35,422	37·13	36·60	1,194	1,175	48,814	46,709	40·92	39·75	4,304	4,226	162,860	163,556	37·97	38·84
13	14	432	449	33·33	32·30	2	1	54	47	30·43	34·49	253	230	6,491	6,650	25·69	28·91
1	2	33	38	25·97	24·96	½	½	8	10	25·40	23·72	197	191	4,979	5,250	25·34	27·55
1,287	1,274	—	—	—	—	1,421	1,408	—	—	—	—	8,863	8,890	—	—	—	—
		Tons	Tons	Tons	Tons			Tons	Tons	Tons	Tons			Tons	Tons	Tons	Tons
130	120	805	546	6·20	4·55	706	677	2,701	1,498	3·83	2·21	1,281	1,194	6,263	4,107	4·93	3·47
475	475	7,641	7,432	16·09	15·64	308	309	4,783	4,134	15·50	13·38	2,200	2,150	28,037	29,785	12·79	13·90
1	1	25	22	19·16	16·04	[1] 54	54	783	751	14·41	13·74	393	410	5,875	7,379	14·99	18·03
11	12	—	—	—	—	[2] 50	46	—	—	—	—	212	213	—	—	—	—
11	11	—	—	—	—	4	4	—	—	—	—	183	204	—	—	—	—
2	2	—	—	—	—	25	24	—	—	—	—	160	157	—	—	—	—
630	622	—	—	—	—	1,148	1,115	—	—	—	—	4,429	4,328	—	—	—	—
		Cwt.	Cwt.					Cwt.	Cwt.					Cwt.	Cwt.	Cwt.	Cwt.
2,403	2,453	—	—	—	—	10,333	10,459	—	—	—	—	34,900	35,084	—	—	—	—
564	532	18,108	16,638	—	—	2,202	2,177	94,620	101,758	—	—	9,034	8,993	228,323	280,854	—	—
—	—	—	—	—	—	72	46	—	—	—	—	74	47	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	54	51	453	411	8·36	8·08
5	5	—	—	—	—	—	—	—	—	—	—	77	70	—	—	—	—
2,972	2,990	—	—	—	—	12,607	12,632	—	—	—	—	34,139	34,245	—	—	—	—

Year 1896	Year 1897	Year 1896	Year 1897	Year 1896	Year 1897
Actual No. 206,504	Actual No. 204,379	Actual No. 553,020	Actual No. 534,138	Actual No 2,115,440	Actual No. 2,069,852
1,207,000	1,223,543	4,407,741	4,463,935	10,941,655	11,004,084
7,466,419	7,423,868	4,080,694	4,157,581	30,853,789	30,567,061
144,615	135,321	1,405,508	1,327,226	4,300,960	3,682,819

[1] Including Beetroot. [2] Cabbage and rape only. [3] Gooseberries, strawberries, currants, and other small fruit.
[4] Including (under Acreage) Isle of Man and Channel Islands.

bushels. In Lincoln, Norfolk, and Suffolk, where much the largest county areas of barley are grown, the estimated yields ranged from slightly under 32 to over 33½ bushels per acre. In oats the decennial average was only exceeded by a small fraction, but the yield was nevertheless a larger one than that for which credit was taken in either 1896 or 1895. The worst yields of oats, compared with a ten years' standard, occurred in Cambridge and in the West Riding of York, where the deficit is given as between 6 and 7 bushels to the acre; while on the other hand the Wiltshire crop was estimated at 6½ bushels over the mean local yield. In Pembroke a still higher excess was reported, and in Scotland, where the crop generally was about half a bushel over the decennial figure, Fife, Perth, Selkirk, and Shetland gave larger over-average results, and Sutherland, Caithness, Kinross, Peebles, and Wigtown, under-average estimates in nearly a similar ratio.

Estimated Yield of Potatoes in Great Britain.—The failure of the potato crop in Great Britain as well as in Ireland to give satisfactory results has already been recognized. The area and the yield both fell in 1897. On a total of 505,000 acres in Great Britain against one of 564,000 acres in 1896, the estimates show a yield of only 5·17 tons per acre against one of 6 32 tons in the preceding season. The mean yield of potatoes in Great Britain over the previous ten years stands at just under 6 tons to the acre, and slightly exceeds this for England alone. The English potato crop was more than two-thirds of a ton less, and the Scotch potato crop was relatively worse, and fell about a ton and a fifth below the normal standard, averaging less than 5 tons to the acre. The counties of Fife, Forfar, and Perth, where the surface under potatoes is much larger than elsewhere in Scotland, estimated their yields in 1897 at only 3½, 4, and 4½ tons to the acre, while the yields of these counties were between 6 and 7 tons per acre in 1896.

Estimated Yield of Roots in Great Britain.—The turnip crop, with a slightly smaller area, and with an estimate of nearly 14 tons to the acre, gave a distinctly over-average yield in 1897 in Great Britain as a whole, an excess over the mean of ten years' estimates appearing in all but six of the 55 counties of England and Wales, and if the results in Scotland were inferior to those in 1896, they were still somewhat above the decennial estimate for that country, notwithstanding very varied results in particular counties.

Mangels were similarly much better than in 1896, and over a ten years' average by something like 10 per cent. The largest yields were reported in Somerset, Derby, and Dorset, where 24 and even 25 tons per acre were respectively exceeded.

Estimated Yield of Hay in Great Britain.—The hay crops of Great Britain proved in estimated yield to have been 5 per cent. over a ten years' average, in the case of hay from clover and rotation grasses, and, in the case of hay cut from permanent grass, more than double this ratio. Although in the case of clover hay 114,000 more acres were reserved for mowing in 1897 than in 1896, the surface of the permanent grass so reserved was reduced by

128,000 acres, making the total area from which hay of all descriptions was cut slightly less, namely, 6,796,000 acres against 6,810,000 acres. The better results, therefore, were thus due to the yield which, on a smaller aggregate surface, furnished nearly 9,000,000 tons against 6,700,000 tons in 1896.

The estimated yield per acre of clover hay in England was 28·75 cwt. compared with 22·55 cwt. In Wales it was 25·26 cwt. compared with 18 17 cwt. In Scotland the estimate for 1897, although a considerably over-average one of 32·13 cwt., did not reach the 33·44 cwt. reported in 1896. Only one English county (Huntingdon), and one Welsh (Merioneth), seem on this occasion to have fallen below an average produce of a ton to the acre, although there were other counties, such as Berkshire, Kent, Leicester, Lincoln, and the East and West Ridings of Yorkshire, where an under-average result was reported. The largest crops were relatively to be found in the West, Cornwall, Devon, Dorset, Monmouth, and Somerset estimating from 4 cwt. to 6 cwt. per acre more clover hay than their average returns over the preceding ten years, while the estimate for Wilts was 7 cwt. per acre above this mean.

The Cornish hay crop, indeed, appears from the reports received to have been over 30 cwt. as against less than 12 cwt. in 1896, while the other western counties named showed excesses of 10 to 14 cwt. each over the poor crop of that season.

The yield of hay from permanent grass was, in England, almost 8 cwt. per acre over that of the preceding season, and nearly as much as this in Wales, while it was more than 2½ cwt. over the decennial average both in England and in Wales. The western counties have here also reversed their experience of 1896, and show yields more than double those of that year; the improvement was, however, even more widespread in England generally than was that in hay from clover and rotation grasses, Yorkshire being practically alone among the larger counties in reporting a fall below a ten years' standard yield. In Scotland the average excess was only slightly above the mean, and the results were not quite so good as in 1896.

Numbers of Live Stock in Great Britain.

Horses.—In examining the results of the annual census of live stock in Great Britain, it may be premised, in the case of horses, that the main heading now includes both horses employed in agriculture and mares kept solely for breeding, a simplification of the schedule being effected in this matter and a cause of uncertainty removed in the figures given for some years back. Attention has been repeatedly drawn to the probability that the distinction between the two classes has not been always strictly maintained, and that the apparent maintenance of the numbers of horses employed in agriculture at a higher level than could be expected in the face of the reduction of land under the plough was only to be explained by

the entry under that head of mares partly employed for farm work, but used profitably for breeding.

The total number of horses employed in agriculture and mares kept for breeding was reduced by a small proportion ($1\frac{1}{2}$ per cent.) in 1897, compared with the totals for 1896, the reduction being fairly general in England and Wales, although in Norfolk, Lancaster, and Chester, and in a few smaller cases, the figures show an increase. It is to be observed, moreover, as indicating a check in the development of horse breeding, that young unbroken horses under one year old are also fewer in number, and among the collectors' reports complaints appear attributing the reduction both to the shortness of keep prevailing during part of last year and to the low prices which were being got for horses, the decline occurring in all three sections of Great Britain and being almost uniform in the counties of England.

Cattle.—In the case of cattle of all kinds, the total difference between the figures of 1897 and 1896 is very slight, but it is in the direction of increase. This increase really occurs in Scotland, since both in England and in Wales the totals are slightly less. The stock of cows is now 2,532,000, or 20,700 over the previous return, and this in spite of some diminution in Wales. The cattle under one year old were, however, less by 26,390 than in 1896, and this in spite of an addition of 8,575 head in the counties of Scotland. The chief falling off in numbers appears to be reported from the west and south-west, and mention is made of shortness of keep in the spring of 1897 as leading to this result. In cattle between one and two years old the totals are, however, greater by 54,400 head, although the stock older than this show a reduction of nearly 42,000. For the last five years the fluctuations in each class of cattle and the total in each group may be conveniently shown as in Table III. for Great Britain as a whole.

TABLE III.—*Numbers of Cattle in Great Britain,* 1893 *to* 1897.

Year	Cows	Cattle of two years old and upwards	Cattle between one and two years old	Young stock under one year	Total cattle
1893	2,555,000	1,580,000	1,355,000	1,211,000	6,701,000
1894	2,460,000	1,517,000	1,217,000	1,153,000	6,347,000
1895	2,486,000	1,432,000	1,190,000	1,247,000	6,355,000
1896	2,512,000	1,365,000	1,306,000	1,311,000	6,494,000
1897	2,532,000	1,323,000	1,361,000	1,284,000	6,500,000

Sheep.—Turning to the figures for sheep, an increase of 81,000 in the number of breeding ewes has to be placed against a stock of lambs reduced in 1897 by 237,000; the numbers of other sheep of one year old and upwards are also less by 209,000. The total flocks of Great Britain, with an aggregate of 26,341,000, are thus less by 365,000 than in 1896, and the changes in recent years are shown in Table IV.

Swine.—The fluctuations in the stock of swine in Great Britain have often been shown to be relatively greater than in the case of

cattle and sheep, and to follow sharply any changes of value. In 1897 there was a large decline of over half a million from the level of the two previous years, carrying the total back again to rather under the number of 1894, not a single county in England and

TABLE IV.—*Numbers of Sheep in Great Britain*, 1893 *to* 1897.

Year	Ewes kept for breeding	Other sheep of one year and above	Total of ewes and sheep one year old and above	Lambs	Total of sheep and lambs
1893	10,129,000	6,911,000	17,040,000	10,241,000	27,281,000
1894	9,668,000	6,343,000	16,011,000	9 851,000	25,862,000
1895	9,663,000	6,334,000	15,997,000	9,795,000	25,792,000
1896	9,926,000	6,428,000	16,354,000	10,352,000	26.706,000
1897	10,007,000	6,219,000	16,226,000	10,115,000	26,341,000

Wales having a movement in the upward direction in the past season. The five years' changes in pigs are shown in Table V., from which it will be seen that the number of breeding sows kept in June last was smaller than in any year since 1893.

TABLE V.—*Numbers of Pigs in Great Britain*, 1893 *to* 1897.

Year	Sows kept for breeding	Other pigs	Total pigs
1893	309,000	1,805,000	2,114 000
1894	351,000	2,039,000	2,390,000
1895	415,000	2,469,000	2,884,000
1896	394,000	2,485,000	2,879 000
1897	334,000	2,008,000	2,342,000

RECENT AGRICULTURAL INVENTIONS.

The subjects of Applications for Patents from June 13 *to Sept.* 10, 1898.

N.B.—Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application. Year 1898.	Name of Applicant.	Title of Invention.
13198	DENING, S. H., & anr.	Guarding feed mouth of chaff-cutters.
13773	LANCE, W. H. J.	Digging forks.
14043	MATHESON, F.	Cutting grass, corn, &c.
14309	SHARP, W. T.	Cultivator.
14426	MCLEAN, P.	Drying and housing cut crops.
15328	FORTESCUE, N.	Destroying seeds, weeds, &c., on land.
15412	SYMES, S. J.	Machine for thinning turnips.
15534	FIELDING, W.	Safety guards for chaff-cutters.
15559	HUNTER, W. A.	Seed drills.
15637	SHAW, V.	Mower and reaper fingers.
15644	BLACKSTONE, E. C., & anr.	Swath turners.

No. of Application. Year 1898.	Name of Applicant.	Title of Invention.
15716	Hogarth, J. & R.	Attachment for threshing machines.
16166	Blake, W. F.	Short lever-necked plough.
16185	Robinson, A. S.	Chaff-cutters.
16192	Levrin, A., and anr.	Potato-digging machines.
16386	Imray, O. (*Barnhart, Canada*)	Apparatus for farm cultivation.
16520	Cottereau, L., & ors.	Digging ploughs.
16708	Fisher, J.	Machine for sowing seed.
16847	Champ, G. W.	Drill cultivator.
17454	Kester, H. J.	Making, &c., bundles of straw, hay, &c.
17470	Apedaile, F. T.	Harrowing machine.
18898	Davis, G. F.	Grass and corn-cutting machines.
18995	De Luca, G. V.	Frame for hop vines.
19066	Eddy, J.	Chaff-cutting machines.
19123	Neumann, J. G.	Treating potatoes.
19221	Mehlhorn, A.	Potato harvester.

Stable Utensils and Fittings—Horse-shoes, &c.

Year 1898.		
13235	Parry, J.	Horse-collars.
13250	Bishop, A. E.	Halter.
13675	Godden, W. J.	Leg baths for horses.
13749	Wright, R. B.	Hoods for shading horses' eyes.
13901	Lake (*Paar, U.S.A.*)	Horse-shoes.
13903	Jobban, J., & anr.	Calkins or studs.
13949	Gray, M. C., & anr.	Horse-shoes.
14366	Patrick, T.	Trace hooks.
15440	Jehin, V.	Leg bands for horses.
15574	Gauzsch, K.	Horse-shoes.
15691	Goodwin, J. H.	Combined steel and rubber harness.
15693	Newman, J. W.	Horse-ring and surcingle.
16374	Peaks, D. W.	Stops for tug plates.
16377	Templer, C. F.	Saddles.
16530	Richardson, W. H., & anr.	Horse-shoe attachment.
16623	Lloyd-Roberts, W., & anr.	Collars and saddles.
16637	Gillett, J.	Horse-shoes.
17027	Bott, J. E., & anr.	Horse-shoes.
17106	Rutter, G.	Horse twitch or purn.
17227	Russell, A. C.	Safety saddle-bar.
17417	Ford, L. P.	Harness and saddlery.
17429	Young, M. J., & anr.	Gear for releasing runaway horses.
17519	Allen, A.	Horse-collars.
17560	Baldwin, H.	Automatic corn-bag.
17655	Lake, H. H. (*Ross, U.S.A.*)	Horse-collar shaping machine.
17664	Liggins, E.	Harness saddles.
17701	Buskirk, S. van	Nosebag.
17702	" "	Training bridle.
17703	" "	Bearing reins.
17730	Waine, D.	Metal hames.
17847	Jenkins, D.	Claps, &c., for harness.
17902	Masurath, E.	Reinholder.
18199	Eaton, W. H., & anr.	Backband and trace easer.
18222	MacLachlan, A. L.	Shaft tugs.
18347	Grayn, E. I., & anr.	Harness hook.
18593	Bielefeld, J. M.	Nosebags.
18657	Laudamore, J., & anr.	Horse-clipper.

No. of Application. Year 1898.	Name of Applicant.	Title of Invention.
18818	HUMBARD, H., & anr.	Horse-shoes.
18889	WETHERED, E. R.	Hooks for connecting curb chains to bridles.

Carts and Carriages.

Year 1898.		
15269	TRIMMER, J.	Fastening for tip-carts.
17902	MASURATH, E.	Reinholder for vehicles.

Dairy Utensils, &c.

Year 1898.		
13229	MOORHOUSE, S, & anr.	Receptacles for dividing cream from milk.
14068	HAUSKEY, O. R.	Apparatus for use when milking.
14405	STOTTENBURG, T.	Mechanical milking appliances.
15535	WOHLGEMUTH, J.	Artificial butter.
15564	HARRIS, J. N.	Producing butter.
15815	NATHAN, A. M. (*Stockhausen, West Indies*)	Butter from cocoanuts.
16033	HANSEN, T.	Combined cream separator and churn.
16437	WATERIDGE, F. W.	Butter transit box.
17304	WRIGHT, J.	Cheese-cutting machine.
17776	KIRKWOOD, J.	Milk receiver.
18112	ADAMS, J., & anr.	Attaching milk cans to doors.
18144	EVES, T., & ors.	Preserving milk, &c.
18145	,, ,,	Preserving and storing milk, &c.
18161	NORCROSS, G. A.	Churns.
18201	LIVINGSTONE, J. A.	Churns.
18500	POPPE, M.	Producing artificial butter.
18561	ARNOTT, L.	Improved "dairy utensil."
19077	HIGGINS, H.	Treatment of separated milk.

Poultry and Game, &c., Appliances.

Year 1898.		
13308	GREVILLE, A. E.	Electro-thermic incubator.
13552	STEELE, E. B.	Feeding chickens, &c.
13864	CORTEEN, W. D.	Hot-water radiating tanks for incubators.
14017	STANCLIFFE, C. W.	Chicken coops.
14125	GREVILLE, A. E.	Electro-thermic incubator.
14525	LYONS, J. & A.	Testing eggs.
16532	BATH, S. H.	Cramming machine.
17034	ROBSON, J.	Poultry-plucking machine.

Miscellaneous.

Year 1898.		
13710	LORENZ, G.	Preparation for protecting against swine fever.
13725	IMRAY, O. (*Dr. Remy, Germany*)	Preventative of swine fever.
17982	HUME, W.	Sheep-shearing machines.
18937	OLSEN, O.	Cattle food.

Numbers of Specifications relating to the above subjects published since June 13, 1898.[1]

(Price 8d. each copy.)

Specifications of 1897.

17077, 17078, 17079, 17185, 17352, 17710, 17754, 18129, 18833, 18877, 18953, 19576, 20404, 20429, 20982, 21035, 22027, 22690, 23116, 23606, 23895, 23926, 24144, 24378, 28435.

Specifications of 1898.

4777, 6706, 7461, 8021, 8376, 8479, 8623, 8992, 9140, 10990, 13308, 12630 12719, 13675, 14405, 14741, 14850, 14982, 15535.

[1] Copies may be obtained at the Patent Office (Sale and Store Branch), Quality Court, Chancery Lane, London, E C.

STATISTICS AFFECTING BRITISH AGRICULTURAL INTERESTS.

Agricultural Returns of Great Britain, 1898.

Preliminary Statement for 1898, compiled from the Returns collected on June 4, and comparisons with previous Years

A.—1898 and the three previous years.

Crops	1898	1897	1896	1895
	Acres	Acres	Acres	Acres
Wheat	2,102,220	1,889,161	1,693,957	1,417,483
Barley	1,903,653	2,035,790	2,104,764	2,166,279
Oats	2,917,770	3,036,056	3,095,488	3,296,063
Potatoes	524,591	504,914	563,741	541,217
Hay from Clover & Rotation Grasses	2,381,551	2,285,965	2,171,966	2,303,431
" " Permanent Pasture . .	4,536,425	4,509,785	4,637,923	4,760,074
Hops	49,735	50,863	54,217	58,940
Live Stock	No.	No.	No.	No.
Cows & Heifers in Milk or in Calf .	2,587,190	2,532,379	2,511,675	2,485,820
Other Cattle:—2 years & above .	1,381,595	1,323,230	1,365,057	1,431,525
" 1 year & under 2 .	1,345,844	1,360,741	1,306,313	1,190,368
" Under 1 year . .	1,307,735	1,284,147	1,310,537	1,246,623
Total of Cattle . .	6,622 364	6,500,497	6,493,582	6,354,336
Ewes kept for Breeding . . .	10,137,932	10,006,697	9,925,587	9,663,129
Other Sheep:—1 year & above .	6,203,858	6,219,001	6,427,982	6,334,386
" Under 1 year . .	10,401,404	10,114,742	10,351,760	9,794,680
Total of Sheep . .	26,743,194	26,340,440	26,705,329	25,792,195
Sows kept for Breeding . . .	362,200	334,244	393,729	415,210
Other Pigs	2,089,395	2,008,058	2,485,072	2,469,221
Total of Pigs . . .	2,451,595	2,342,302	2,878,801	2,884,431

B.—1898 compared with 1897 and 1896.

Crops	1898 compared with 1897				1898 compared with 1896			
	Increase		Decrease		Increase		Decrease	
	Acres	Per cent.	Acres	Per cent.	Acres	Per cent.	Acres	Per cent.
Wheat	213,059	11·3	..	..	408,263	24·1	..	..
Barley	..	..	132,138	6·5	..	..	201,112	9·6
Oats	..	..	118,286	3·9	..	..	177,718	5·7
Potatoes	19,677	3·9	..	..	..	..	39,150	6·9
Hay from Clover	95,586	4·2	..	..	200,585	9·6	..	..
„ „ Pasture	26,640	0·6	..	..	..	..	101,498	2·2
Hops	..	..	1,128	2·2	..	..	4,482	8·3
Live Stock	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
Cows	54,811	2·2	..	..	75,515	3·0	..	..
Other Cattle:—2 years & above	58,365	4·4	..	..	16,538	1·2	..	..
„ „ 1 year & under 2	..	..	14,897	1·1	39,531	3·0	..	..
„ „ Under 1 year	23,588	1·8	..	..	..	..	2,802	0·2
Total of Cattle	121,867	1·9	..	..	128,782	2·0	..	..
Ewes	131,235	1·3	..	..	212,345	2·1	..	..
Other Sheep:—1 year & above	..	..	15,143	0·2	..	..	224,124	3·5
„ „ Under 1 year	286,662	2·8	..	..	49,644	0·5	..	..
Total of Sheep	402,754	1·5	..	..	37,865	0·1	..	..
Sows	27,956	8·4	..	..	..	..	31,529	8·0
Other Pigs	81,337	4·1	..	..	..	..	395,677	15·9
Total of Pigs	109,293	4·7	..	..	..	..	427,206	14·8

Acreage of Hops.

Preliminary Statement compiled from the Returns collected on June 4, 1898, showing the Acreage under HOPS in each County of England in which Hops were grown, with a Comparative Statement for the Years 1897, 1896, and 1895

Counties	1898	1897	1896	1895
	Acres	Acres	Acres	Acres
Berks	—	—	4	—
Gloucester	40	40	49	38
Hants	2,263	2,306	2,494	2,875
Hereford	6,651	6,542	6,895	7,553
Kent	30,941	31,661	33,300	35,018
Monmouth	2	2	—	—
Salop	126	129	140	150
Suffolk	3	2	4	10
Surrey	1,313	1,416	1,623	1,783
Sussex	4,829	5,174	5,908	7,489
Worcester	3,567	3,591	3,800	4,024
Total	49,735	50,863	54,217	58,940

Note.—The following counties show *decreases*, to the extent named, in 1898:—Kent, 720 acres; Sussex, 345 acres; Surrey, 103 acres; Hants, 43 acres; Worcester, 24 acres; Salop, 3 acres. The *increases* are Hereford, 109 acres; Suffolk, 1 acre. The effective *decrease on the year* is 1,128 acres.

Areas of **Cereal Crops, Potatoes,** *and* **Hay,** *and Numbers of* **Cattle, Sheep,** *and* **Pigs** *in England, Wales, Scotland, and Great Britain (as returned on June 4) in* 1898 *and in* 1897.

Crops		England	Wales	Scotland	Great Britain
		Acres	Acres	Acres	Acres
WHEAT	1898	1,987,385	58,960	55,875	2,102,220
	1897	1,785,562	53,810	49,789	1,889,161
Difference in 1898		+201,823	+5,150	+6,086	+213,059
BARLEY	1898	1,562,761	102,921	237,970	1,903,652
	1897	1,698,323	104,371	233,096	2,035,790
Difference in 1898		−135,562	−1,450	+4,874	−132,138
OATS	1898	1,731,167	230,670	955,933	2,917,770
	1897	1,829,072	238,510	968,474	3,036,056
Difference in 1898		−97,905	−7,840	−12,541	−118,286
POTATOES	1898	365,432	32,797	126,362	524,591
	1897	352,365	32,609	119,940	504,914
Difference in 1898		+13,067	+188	+6,422	+19,677
HAY FROM CLOVER AND ROTATION GRASS	1898	1,779,341	199,959	402,251	2,381,551
	1897	1,692,612	196,251	397,102	2,285,965
Difference in 1898		+86,729	+3,708	+5,149	+95,586
HAY FROM PERMANENT GRASS LAND	1898	3,932,330	474,492	129,603	4,536,425
	1897	3,901,563	473,725	134,497	4,509,785
Difference in 1898		+30,767	+767	−4,894	+26,640
Live Stock		No.	No.	No.	No.
CATTLE	1898	4,674,303	701,777	1,246,284	6,622,364
	1897	4,567,834	709,120	1,223,543	6,500,497
Difference in 1898		−106,469	−7,343	+22,741	+121,867
SHEEP	1898	15,886,538	3,268,708	7,587,948	26,743,194
	1897	15,721,213	3,195,359	7,423,868	26,340,440
Difference in 1898		+165,325	+73,349	+164,080	+402,754
PIGS	1898	2,078,898	238,581	134,116	2,451,595
	1897	1,990,534	216,447	135,321	2,342,302
Difference in 1898		+88,364	+22,134	−1,205	+109,293

NOTE.—The *Difference* lines show the increase (+) or decrease (−) in 1898, as compared with 1897.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

THE POTATO.

Among the valuable plants introduced into Europe for the sustenance of man, not one has aroused so deep an interest as "the noble tuber," and we are indebted to the efforts of enthusiasts during the past three centuries for the very existence of the cultivated potato at the present day. Botanists quickly perceived its national importance as an article of food, and from 1597 to our own time there has been an intermittent issue of books, pamphlets, and reports concerning this vegetable. The literature on the subject forms quite an extensive library, including works published in the United Kingdom, France, Germany, the United States, Australia, and other countries. Several of the older writers were evidently keen observers, and they must have acquainted themselves intimately with the history and character of the potato. Modern authors include the names of men who have attained eminence in the botanical world. We are their debtors for careful research and for deeply interesting and instructive records of failures and successes. As a legacy they have bequeathed to us the duty of maintaining and improving the potato for the welfare of mankind.

To me the possibilities of the plant have long been a source of attraction, amounting almost to fascination. The information gained from an exhaustive series of experiments, extending over a period of twenty-five years, has formed the subject of lectures I have had the honour of preparing for the Royal Horticultural Society in 1895, the Dublin Potato Tercentenary Conference in 1896, and the London Farmers' Club in 1897. These lectures have been published and circulated in the usual channels, so

that I cannot claim to place the details before the readers of this Journal "for the first time"; but the particulars which are relevant to the present purpose I propose to utilise, together with the photographs taken expressly to illustrate the subject. The major part of this paper, however, has not previously been published. Sections are included relating to the manures most suited to potatoes, as demonstrated by the series of experiments made in connection with Reading College during the years 1895 to 1898 inclusive[1]; the composition and comparative feeding value of potatoes[2]; the diseases, in addition to *Phytophthora infestans*, which attack the potato; and a series of reports on methods of cultivating crops for market. In most cases the details for these reports were obtained as the result of visits paid by me to the Channel Islands, France, and Scotland, and the photographs were specially taken or obtained for this article.

NATURAL DISTRIBUTION OF THE POTATO.

In referring to the distribution of the potato plant (*Solanum tuberosum*) I cannot do better than quote from Professor Johnson's paper read at the Dublin Tercentenary. The Professor says:—

> The conclusions arrived at by M. A. de Candolle, after careful consideration of all the evidence available, are as follow:—1. The potato is indigenous in Chili, in a form which is still seen in our cultivated plants. 2. It is very doubtful whether its natural habitat extends as far as Peru and New Granada. 3. The cultivation was spread, before the discovery of America, from Chili to New Granada. 4. It had been introduced probably before the second half of the sixteenth century into that part of the United States which we call Virginia and North Carolina.

Fig. 1 shows the natural habitat of the six tuber-bearing species which Mr. Gilbert Baker, of the Royal Herbarium, Kew, considers to be distinct. Professor Johnson has kindly allowed me to reproduce this sketch map.

The genus Solanum includes no less than seven hundred species of plants. Of these, twenty only are tuber-bearing, and Mr. Baker, in his able paper entitled "A Review of the Tuber-bearing Species of Solanums," read before the Linnean Society, has summed up the evidence in favour of his opinion that only

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[1] This section, commencing on p 615, was prepared in collaboration with Mr. D. A. Gilchrist, of Reading College; and I am glad to have this opportunity of acknowledging the untiring energy and skill he has devoted to the experiments, and the time he has given to the preparation of the report.

[2] For the information and analyses contained in this section I am anxious to express my indebtedness to Dr Luxmoore, of Reading College (see p 621).

FIG 2 —Solanum tuberosum

FIG 3 —Solanum Maglia

FIG 4—Solanum Commersoni

FIG. 8.—Solanum cardiophyllum

FIG. 9.—Solanum Fendleri.

FIG 6 —Solanum Jamesii.

FIG 10 —Solanum etuberosum

that I cannot claim to place the details before the readers of this Journal "for the first time"; but the particulars which are relevant to the present purpose I propose to utilise, together with the photographs taken expressly to illustrate the subject. The major part of this paper, however, has not previously been published. Sections are included relating to the manures most suited to potatoes, as demonstrated by the series of experiments made in connection with Reading College during the years 1895 to 1898 inclusive[1]; the composition and comparative feeding value of potatoes[2]; the diseases, in addition to *Phytophthora infestans*, which attack the potato; and a series of reports on methods of cultivating crops for market. In most cases the details for these reports were obtained as the result of visits paid by me to the Channel Islands, France, and Scotland, and the photographs were specially taken or obtained for this article.

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six "possess a fair claim to be considered as distinct species in a broad sense." These are :—

Solanum tuberosum	Fig 2	*Solanum cardiophyllum* .	Fig. 5
Solanum Maglia	" 3	*Solanum Jamesii*	" 6
Solanum Commersoni .	" 4	*Solanum oxycarpum*	" 7

Of the remaining fourteen, Mr. Baker believes twelve to be mere forms of *Solanum tuberosum*, and two to be varieties of

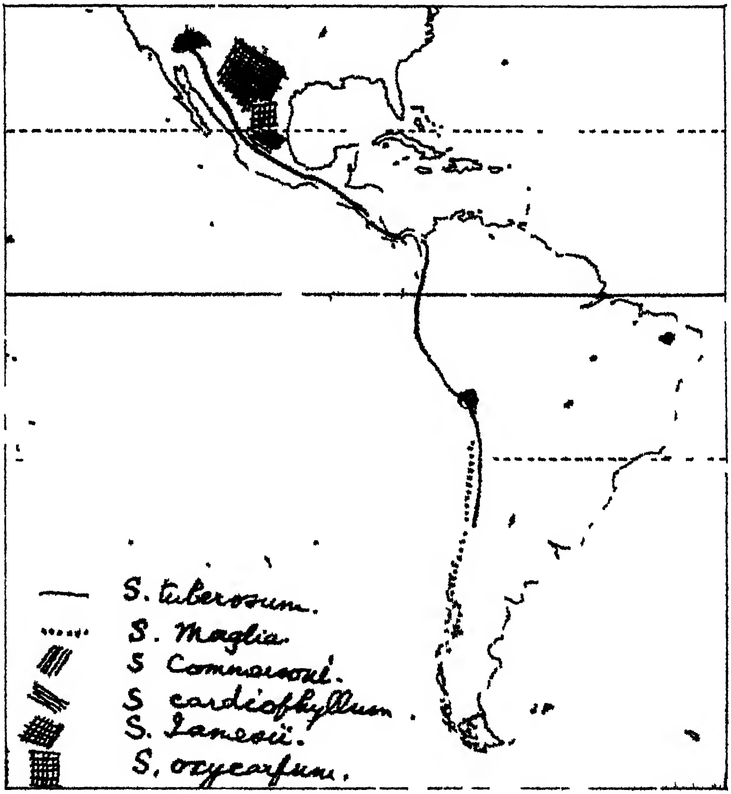

Fig 1—Natural habitat in America of six tuber bearing species of Solanum

Solanum Commersoni. Three of the fourteen are illustrated on the accompanying sheet, viz. :—

Solanum verrucosum .	Fig 8	*Solanum etuberosum* .	. Fig. 10
Solanum Fendleri .	. " 9		

These illustrations show the character of the foliage and flowers. For permission to reproduce some of them,* I am

indebted to the Council of the Linnean Society, and for others to Mr. Baker himself.

By comparing specimens of any of the Solanums illustrated in figs. 2 to 10 with specimens of *Solanum nigrum*, the common Nightshade, a weed found in many gardens, or with *Solanum*

FIG. 11.—Solanum nigrum

capsicastrum, the popular red-berried table plant, it will at once be apparent that plants belonging to the same genus may differ greatly in general appearance. Yet the resemblance between the flowers and berries of *Solanum nigrum* (fig. 11) and those of the potato (*Solanum tuberosum*, figs. 37 and 39) cannot escape

FIG. 12.—Solanum nigrum grafted on Solanum tuberosum.

FIG. 13.—Solanum Dulcamara

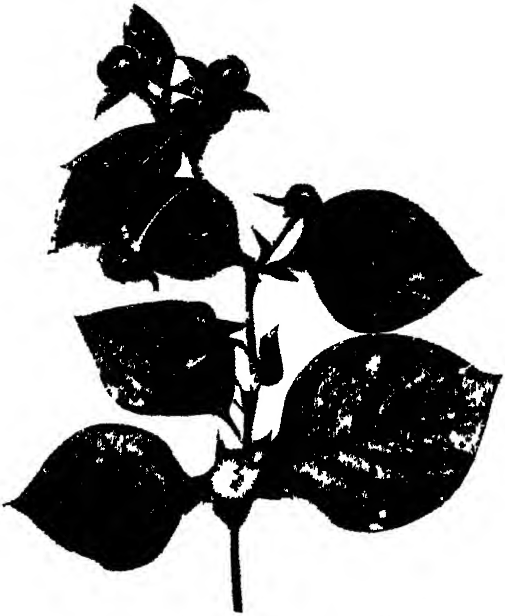

FIG 14 —Atropa Belladonna (*Solanum lethale*)

FIG 15 —Tomato Flowers

attention, and the affinity between allied species is demonstrated in fig 12, which shows *Solanum nigrum* grafted on *Solanum tuberosum* To accomplish this, a potato was planted in a pot When the haulm attained the height of five inches it was cut down to half an inch, and a graft of *S. nigrum* was inserted In due time the graft united with the potato stem, from which

Fig 11 —Bunch of Tomatoes and Flowers

the photograph for fig 12 was taken. I do not suggest that such grafts have any immediate practical result, but the effect of thus uniting two allied species, differing in habit of growth, has in some instances been exceedingly curious and interesting.

Other members of the order Solanaceæ are shown in the accompanying illustrations :—

Fig. 13. *Solanum Dulcamara*, the poisonous Woody Nightshade, or Bitter-sweet, frequently found in hedgerows growing alongside blackberries. This plant has also been successfully grafted on the Potato.

Fig. 14. Deadly Nightshade, described by Sir J. E. Smith in his "English Flora," published in 1824, as *Solanum lethale*, now known as *Atropa Belladonna*.

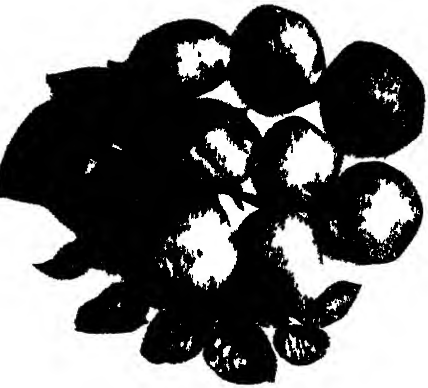

FIG. 17 —Solanum etuberosum.

Fig. 15. A spray of Tomato flowers. Formerly the Tomato was known as *Solanum Lycopersicum*; now it is recognised as *Lycopersicum esculentum*.

Fig. 16. A bunch of Tomatoes and flowers which strongly resemble the flowers and berries of Potatoes.

Fig. 17. *Solanum etuberosum*, grown for many years in the Edinburgh Botanical Gardens, and sent to me in 1887 by the Curator, Mr. Lindsay.

FIG 18 —Papa Amarilla

In its wild state this Solanum produced scarcely any tubers, but continued cultivation has resulted in a marked development, although the tubers possess no special merit.

Fig. 18. *Papa Amarilla*. This illustrates a potato I received from Mr. Charles ap Thomas, who spent a great part of his life in Peru. Knowing that I took an interest in tracing the history of the cultivated Potato, he

offered in 1887 to obtain for me tubers of the *Papa Amarilla*, which is much grown in Peru, and is in some respects unlike our own cultivated varieties. After carefully growing this variety for eight years, I entertain no doubt that, however suited to Peru, it is of no use in this country, where it fails to produce a satisfactory crop, and is extremely susceptible to the attack of Phytophthora.

19.—African Potato.

Fig. 19. A correspondent saw this Potato growing in South Africa, and sent me tubers, thinking it very different from any he had seen in England. This has been grown at Reading for seven years, and is distinct from all the Potatoes known to me in tuber, foliage, and flower. The foliage

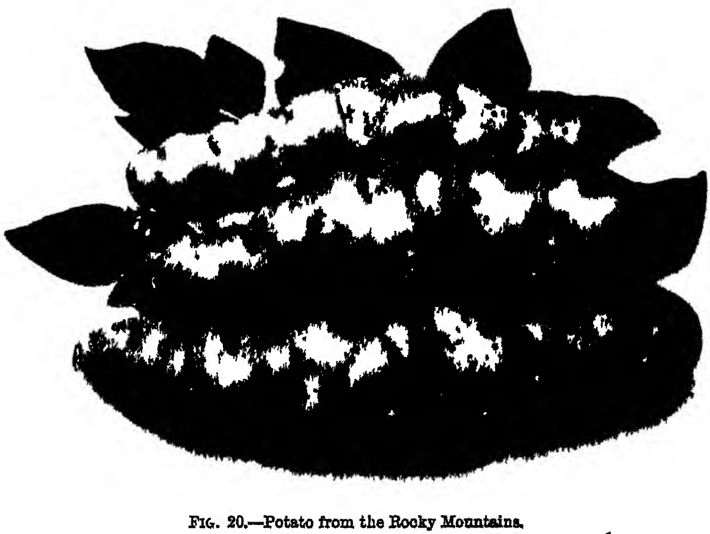

FIG. 20.—Potato from the Rocky Mountains.

is exceedingly dark in colour; the stems are erect and very bushy, growing more densely than any other variety; and the leaves are so round as to appear at first sight unlike those of the Potato. The tubers are white, mottled with purple, mostly oblong, with the eyes or buds almost as strongly developed

as in the Fir-apple varieties. The haulm bears a profusion of purple flowers. No disease was seen until 1894, but in that and succeeding years it suffered badly.

Fig. 20. The subject of this illustration was found growing apparently wild in the Rocky Mountains by Mr. R. A. Strickland, and sent to me through Mr. Hunt, of Reading, in February 1893. It is almost a counterpart of the large white Fir-apple Potato, which it resembles both in tubers

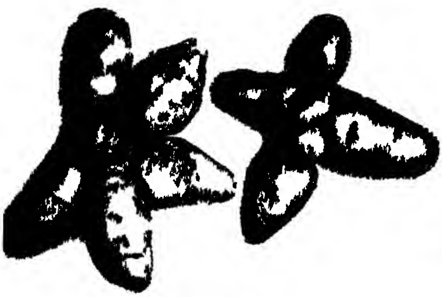

Fig. 21.—Red Fir-apple Potato

Fig. 22.—Small White Fir-apple Potato

and foliage. The tubers are often similar in shape to a spruce fir cone, the eyes being very numerous and deeply set. It was much diseased in 1894 and in subsequent years.

Fig. 21. The Red Fir-apple Potato, so named from a peculiar formation of the tubers. This has been grown at Reading for many years, but has

Fig. 23.—Black Congo Potato

Fig. 24.—Almond Potato

never shown any tendency to assume the form or characteristics of the ordinary Potato of commerce.

Fig. 22. The small White Fir-apple, which has also been grown, with the same results, at Reading; it differs from the Red Fir-apple chiefly in colour.

Fig. 23. The Black Congo Potato, like the Fir-apple varieties, has the

buds or eyes very strongly developed. Though the tuber has excellent flavour when cooked in the ordinary way, it is chiefly grown for the colour of the flesh, which is a dense purple, almost black. On account of this deep colour the tubers are useful for ornamental cookery.

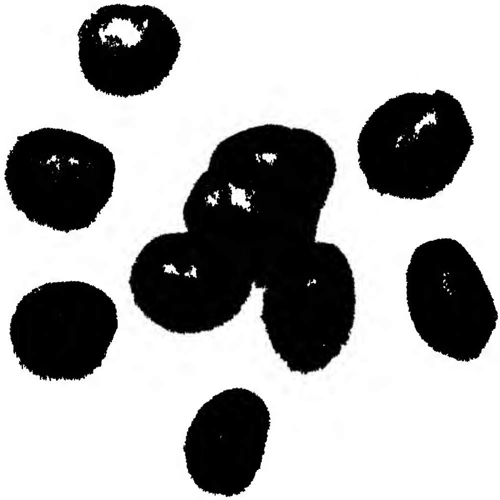

FIG. 25.—Solanum Maglia (Tubers).

Fig. 24. The Almond Potato, which is grown rather extensively in Norway. Commander F. W. E. Crowe, who sent it to me, considered this to be extremely valuable for the supply of so-called new Potatoes

FIG. 26.—Hybrid Seedling Potato.

throughout the year. The tubers seldom exceed the size of an almond, and by lifting the crop before it is quite ripe the close texture peculiar to new potatoes is retained.

Fig. 25. *Solanum Maglia.* Chiefly on account of the fact that the dreaded potato fungus produces most havoc in damp seasons it was very much hoped by Lord Cathcart that, if hybrid seedlings could be obtained between *Solanum Maglia* and *Solanum tuberosum*, a new race of potatoes might be secured that would resist disease.

Although many hundred flowers of *Solanum Maglia* were artificially fertilised with pollen from cultivated varieties, only five were successful

Fig. 27.—Portrait in frontispiece of Gerarde's "Herbal."

resulting in five seed berries. From these seed berries but two seedlings were secured, and only one showed any promise whatever, the second having to be grown under glass to save it from extinction. I regret to say that in 1894 the outdoor crop of *Solanum Maglia* was almost destroyed by disease, while the plants grown indoors escaped.

The hybrid Seedling resulting from the cross just referred to is illustrated in fig. 26. Although a considerable improvement on *Solanum Maglia*, it is very far behind the ordinary cultivated potato in appearance,

crop, and qualities. The seedling has been grown for eight years, and in 1894 the crop first showed traces of disease; previously it had been nearly free

Introduction of the Potato into Europe and the United Kingdom.

A century ago Dr. Wright, of Edinburgh, made the following communication to the Committee of the Board of Agriculture:—

In 1584, Sir Walter Raleigh discovered that part of America called Norembega, and by him named Virginia Whether the admiral was

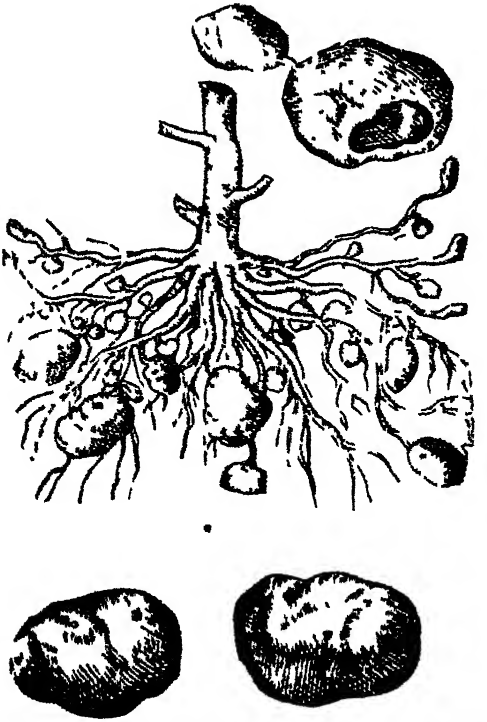

FIG. 28.—Reproduction of Gerarde's engraving of the Virginian potato.

acquainted with the potato in his first voyage, or whether it was sent to him by Sir Thomas Grenville, or Mr. Lane, the first governor of Virginia, is uncertain. It is probable that he was possessed of this root about the year 1586. He is said to have given it to his gardener in Ireland, as a fine fruit from America, which he desired him to plant in his kitchen garden in the spring. In August this plant flowered, and in September produced a fruit; but so different from the gardener's expectation, that in an ill humour he carried the potato-apple to his master. "Is this (said he) the fine fruit from America you prized so highly?" Sir Walter either was, or pretended

to be, ignorant of the matter; and told the gardener, "since that was the case, to dig up the weed, and throw it away." The gardener soon returned with a good parcel of potatoes.

Loudon's Encyclopædia (bearing date 1836) thus confirms the date of introduction:—

It appears probable that the potato was first brought into Europe from the mountainous parts of South America in the neighbourhood of Quito, where they were called *papas*, to Spain, early in the sixteenth century. From Spain, where they were called *battatas*, they found their way to Italy, and there received the same name as the truffle, *taratoufli*. From Italy they went to Vienna, through the Governor of Mons in Hainhault, who sent some to Clusius in 1598. To England the potato found its way from North America, being brought from Virginia by the colonists sent out by Sir Walter Raleigh in 1584, and who returned in July, 1586, and "probably," says Sir Joseph Banks, "brought with them the Potato."

Gerarde's "Herbal," published in 1597, contains the earliest description of the potato known to me. In the edition I possess, dated 1636, a portrait (fig. 27) appears on the frontispiece, showing in one hand a spray of potato foliage. It may therefore be inferred that the plant was regarded as the most important subject in this immense volume. On p. 927 there is a woodcut representing the potato as it was known three hundred years ago. This illustration has been reproduced by photography (fig. 28), and it affords an opportunity of making comparisons very much in favour of the potato of to-day.

Amongst a great deal of matter which is not without interest, Gerarde mentions that the potato

groweth naturally in America, where it was first discovered, as reporteth Clusius, since which time I have received roots hereof from Virginia, otherwise called Norembega, which grow and prosper in my garden as in their owne native country.

The leaves thrust forth of the ground in the beginning of May; the flours bud forth in August, the fruit is ripe in September

Monsieur Henry L. de Vilmorin, in a lecture on the best kinds of potato, given before the Agricultural Society of Paris on January 30, 1888, mentions that in England the potato rapidly obtained a position amongst the common vegetables of the garden. On the Continent its progress was attended with greater difficulty. The prejudices which existed against its general use were, however, combated with energy by certain men devoted to the public welfare, such as Duhamel du Monceau, Inspector-General of Naval Construction, Mgr. du Barral, Bishop of Castres, and the Minister Turgot himself. It was reserved to Monsieur Parmentier to succeed where so many able men had failed, and his success was due above all things to his

perseverance and the tact with which he used his intimate knowledge of the character of *les Parisiens* Instead of trying to convince them by argument, he undertook, with the consent of the King, Louis XVI., to plant potatoes on the plain of Les Sablons, and, surrounding his experiments with an air of mystery, he had the plot guarded by a cordon of troops, and thus succeeded in adding to the curiosity of the people. He then invited a number of scientific and influential men to a banquet where every dish was either composed chiefly of potatoes, or was served up with potatoes as an accompaniment. This proved the most eloquent demonstration possible of the culinary value of the new vegetable, and his cause was gained. At the end of the eighteenth and in the early years of the nineteenth century the potato made great progress in France, and when, in 1813, the Central Society of Agriculture undertook to provide a collection of the varieties in use throughout the French Empire, it brought together no less than 115 varieties.

Count Rumford, in the middle of the last century, tells of the trouble he experienced in persuading the people of Munich to use the potato as food, even in a time of great scarcity. Only by disguising the potato in soup did they gratefully accept the Count's offering.

As a contrast it will be interesting to notice here that the area planted with potatoes in the United Kingdom from 1888 to 1897 inclusive averaged for the ten years 1,279,949 acres, resulting in crops which averaged 5,700,115 tons, or 4·45 tons per acre per annum.

In France the area planted is generally three times, and in Germany about six times, greater than the area planted in the United Kingdom. With us, however, potatoes are grown almost entirely as an esculent, whereas in France about two-fifths of the total produce, or as much as four million tons, are annually consumed in the manufacture of starch and alcohol; while in Germany about 1½ million tons are employed for distilling purposes alone.

Deterioration.

It is scarcely necessary to explain that potatoes are enlargements of underground stems, shortened and thickened, in which starch is stored up in smaller or larger proportion, according to the characteristics of the several varieties. Like other underground stems, the tubers possess buds or "eyes," from which, by fresh shoots, the plant is capable of reproduction; and although the tubers may be preserved through the winter

for planting again in the following spring, they are neither more nor less than portions of the plant which died down and apparently ceased to exist in the preceding autumn. Hence the life of a single potato plant may be prolonged year after year until through weakness or deterioration it comes to an end. It will therefore be obvious that improvement by selection of the tubers is impracticable. For though each of eight, ten, or twenty tubers attached to one plant may differ slightly in size and shape, not one of them when planted can do more than reproduce a plant similar to that of which they individually formed an integral part. This can be demonstrated by planting a tuber which from any cause may be misshapen; the produce will revert to the uniform type of the variety to which it belongs. The only modification of this rule which I consider possible is when *all* the tubers of one plant show a uniform divergence in character, either for better or for worse, *accompanied in the foliage by a divergence from the type.* By planting these tubers and continuously *selecting the plants during growth,* a slightly different potato might result, as in the case of some types of the Ashleaf section, which are smaller and more compact than others, and *vice versa.* Outside the Ashleaf class, however, I know of no such instances.

When a seedling potato has once assumed a fixed type or character, generally about the fifth or sixth year from the fertilisation of the flowers on the parent plants, no development is possible in productiveness, quality, or power of resisting disease. Therefore it is not surprising that constant repetition of growth from the tuber should, sooner or later, bring with it a loss of vigour, resulting in diminished productiveness, and in greater susceptibility to the attacks of the dreaded *Phytophthora infestans* and of other diseases to which the potato plant is liable. The evil day may be postponed, and deterioration warded off for a time, by a judicious change of seed, especially if the soil devoted to the crop be very heavy, or very light and sandy, or has marked characteristics such as the Fen lands of Lincolnshire and Cambridgeshire, and the Moss lands of Lancashire. In such soils a change of seed is more beneficial than where soils combine all the characteristics which favour a good potato crop, and of these a sandy loam may be regarded as the best type.

When a change of seed from any kind of soil fails to arrest deterioration in a potato it is generally wise to substitute some other and newer sort, even though the career of the failing potato in especially favoured districts may perhaps still be profitably prolonged for several years. During the past season I have seen

in Scotland crops of nine to twelve tons an acre of splendid ware, from varieties which have for some years been practically discarded in the south. The crops of these potatoes in Scotland were in no way inferior to those produced when the varieties were first sent out. This shows that it is of the greatest importance to discover what potato is really best suited for any particular district or soil.

Assuming that during the five or six years of its development a seedling potato has been free from disease, and has shown indications that it is equal or superior to existing varieties, no evidence is presented either in the tuber or the haulm that a long or short career is before the seedling. There are no possible means of forming an opinion on this point. Time alone can reveal the truth. It has been suggested that a potato which produces many seed berries will weaken its constitution and the more speedily die out. But the Ashleaf class has always produced seed berries freely, varying according to the season and soil, and this class, or family, is still cultivated although it has probably been in existence as long as any potato now grown. On the other hand, several potatoes could be named which did not yield seed berries and whose lives have been very short indeed.

Again it might be supposed that a potato having strong, robust haulm, with plenty of fibre in the stem, has come to stay, while others with comparatively slight, delicate, and succulent haulm will speedily make way for newer introductions. Facts, however, do not support any such theory. Some varieties, such as Ringleader, introduced in 1884, producing very little haulm, and that of a succulent nature, are in all respects as good now as when first offered; whereas others, apparently more robust, have ceased to be grown.

The question naturally arises, is it wise to attempt to grow any one variety in the same district for many successive years? The answer depends entirely on local and personal considerations. Undoubtedly a few sorts now exist which are as good in quality and productiveness, and as free from disease, as when first sent out, but it does not follow that these are equally suited to every district, or that more acceptable sorts have not since been introduced. It cannot be affirmed of any potato that it meets the requirements of every locality; nor can it be claimed that any variety yet raised is absolutely "disease proof," even though, as in the case of the Flourball, no diseased tuber may yet have been found. When Magnum Bonum was first distributed it approached these two conditions more nearly than any other sort then grown, and so far this potato has stood

the test of time. On soils where Magnum Bonum originally did well it does so still, and when autumn months are dry the quality was never better or the crop heavier. As to immunity from disease the Blue Book containing the Agricultural Statistics for Ireland, 1890, showed that Magnum Bonum was then far superior to all other varieties. Again, in the disastrous year 1891, this potato had no rival as a disease resister. Needless to say, it has been renamed many times. Against Magnum Bonum it may be freely conceded that, except for the first early crops, kidney potatoes are not generally in favour on the market, and, in a year when disease is not prevalent, preference is given to round or pebble-shaped varieties, provided they crop well and are not inferior in quality. Besides this, in a wet autumn following a dry summer, Magnum Bonum is liable to grow out. This has always been the case since its introduction. Still, from an average potato soil, few sorts cook better than Magnums, or keep better, and in seasons when the Phytophthora is rampant, no other white-skinned potato resists the disease to an equal extent.

Diseases.

The Potato is unfortunately subject to attack by various diseases. Some of these are intermittent, others are restricted by soil or climate. The most malignant of all, however, is both persistent and universal, and is familiarly known as "the disease." It will be convenient to allude first to those of minor importance, and to reserve the deadly Phytophthora for more lengthened consideration.

Rust, Curl, or Dry Rot.—English growers are happily less troubled with this form of disease (fig. 29) than is the case in America. In fact rust is practically non-existent in potatoes of English origin, and seldom, if ever, is seen except in potatoes of American introduction, or in seedling potatoes raised by crossing American with English varieties. Were American sorts entirely discarded in raising seedlings, rust would probably disappear But as Transatlantic potatoes are invariably white in the flesh and often prolific, they will for these qualities doubtless be occasionally used by the hybridiser.

Attacks of rust rarely, if ever, extend over the entire crop. Individual plants in various parts of a field are attacked, and the disease may appear at any period of growth after the haulm is 8 in. to 12 in. above ground. The affected plants first turn yellow, then rusty brown, and soon wither and die. Rust is undoubtedly more often seen on very light soils and in very dry seasons than when the atmosphere is moist and the

land retentive. No remedy or preventive is known where potatoes of American origin are planted

Internal Disease.—In connection with the experiments conducted at the Leamington centre, Colonel Cornwallis West forwarded to Reading College in 1895 a sample of soil, and of potatoes grown thereon, taken from a field adjoining that in which the experiments were carried out The potatoes were badly affected with what is known as "internal disease," which Professor Marshall Ward, advisory expert on such subjects to the College, has been investigating. He finds that the tubers are affected with what the Germans call "Trockenfaule," which

Fig. 23.—Potato attacked by rust

is believed (on insufficient evidence as yet) to be due to a bacterium. The soil on which the potatoes were grown has been analysed by Mr. Burnett, who has found that it is exceptionally poor in phosphates, potash, and lime. This probably explains why the crop succumbed readily to the internal disease While growing, the plant betrays no sign of the mischief, and only in exceptional instances is there any indication of its presence until the tubers are cut.

Little is at present known of the cause of this disease or of its life history. I have never met with an example of it in potatoes grown on strong and heavy soils; but on sandy or light loams the crop has been ruined to the extent of from

20 to 60 and even 70 per cent. When cut open, a potato attacked by this disease has very much the appearance often seen in Ribston Pippin and other apples. The flesh is infested with brown spots which spread and result in decay.

A suggestion has been made that highly nitrogenous manures, such as refuse from tanneries, may produce this disease. In practice, the only safe rule is to avoid planting potatoes in fields which have produced affected crops.

Potato Scab.—In certain seasons this disease seriously lessens the value of a potato crop. Instead of the tubers having a clear, bright skin, a great part, or the whole crop, may consist of tubers covered with scab. Much has been written as to the origin of the disease and its remedy, but at present comparatively little is known about it. I believe that scab is seldom seen in a season when the crop has had a sufficiency of moisture throughout its entire period of growth, but that after tubers are formed a dry period of several weeks is often followed by the appearance of scab.

Mr. Worthington Smith supports this opinion in the following statement:—

> Scabbing begins in a very early stage of growth in the tubers, and is at first seen as small corroded spots or minute open pustules. In bad cases the spots and cracks become confluent, and the whole bark of the potato presents an unsightly appearance. Scab and cracking are said in the first instance to be due to some irritating or corrosive substance in the soil. Continued drought, and possibly sudden and superabundant moisture, will also form one kind of scab. A natural effort is made by the potato to repair the injury, and so a hard scab originates. Lime rubbish, builders' refuse, refuse from ashpits, and other materials are said to cause corrosion, scab, and cracking of the bark of potato tubers by contact. It generally happens that a portion of the crop of potatoes is scabbed, and this portion can be often distinctly traced to one part of the field whence the potatoes were derived. On visiting this position, the irritating substance in the soil will usually be seen. When scab and cracking can be thus traced, the remedy is obvious.

The attempt to eradicate scab by an application of sulphur, made at the New Jersey Experimental Farm in 1895, was to a certain extent successful; but in the Reading trial grounds little difference could be perceived between the crops from tubers that had been rolled or dressed with sulphur and others not so treated growing alongside. In 1896 the authorities at the New Jersey Farm made additional experiments with corrosive sublimate, which checked the scab; but the mere soaking of the seed was considered ineffective, and they think that the corrosive sublimate should be added to the soil. Dr. Halsted of the above station believes that the ordinary flower of sulphur has given the most satisfactory results. This

is dusted in the rows at the rate of 200 lb. per acre. The New Hampshire College Experiment Station has issued a report confirming this view.

No remedies that have been suggested are, in my opinion, either efficacious or likely to repay the grower for the outlay involved. If the tubers are covered with sulphur before planting, it is by no means certain that the crop grown from these tubers will be free from scab; and after incurring the outlay for labour, &c., the season may not be of a character to produce this form of disease Moreover, on suitable soil excellent crops have been grown, without the application of sulphur, from seed tubers which have been very badly scabbed. It is therefore safe and economical to conclude that the growth of potatoes should be discontinued on soils where crops have become scabbed.

Phytophthora infestans.—So long ago as 1797 a Committee appointed by the Board of Agriculture, in view of an anticipated scarcity of corn, published a most exhaustive report on the potato, with the object of encouraging, "by such means as were in the power of the Board, a more extensive cultivation of potatoes; the early sorts of which root promising a remedy to a deficiency of corn late in the summer; and other sorts tending to add greatly to the national stock of food, should the scarcity continue beyond the harvest."

This old report is full of matter which is of the greatest interest to the present generation of potato growers. The potatoes named include the following:—

Ox Noble.
Cluster.
Old Winter Red.
Early Champion.
Surinam.
The Kidney.
Apple.
Pink Eyes.
Copperplates.
The Blacks.
Purple Streaked.
Blackamoors.
Killamancas.
Round White.
Round Red
Red Nose Kidney.
Aylesbury White.
White Kidney.
Red Kidney.
Pheasant Eye.
Dutch Upright.
Pink Nose.
Horse Legs.
Goldfinder.
Golden Tags.
Red Neb.
Incomparable (a seedling)
Dennes Hill (a seedling).
Bayley's Seedling.
Manley White.
Commonwife.
Kentish Seedling.
Red French.
Munster White.
Crones.
Spanish.
Quakerwife.
White French.
English White.
Early Red.
Early White.
Irish Dun.
Smooth Winter White.
Irish Blue.
Old English Red.
The Royal or Cumberland Early.
White Lancashire
Golden Dun.
White Russett.
Red Russett

This list compiled under Government supervision one hundred years ago contains scarcely any potatoes known at the present day. With the cause we are all unfortunately too

familiar, and readers of this Journal will remember the exhaustive paper which Lord Cathcart contributed to Vol. XX. (2nd series) in 1884.

From slides which Professor Johnson, of the Royal Dublin Herbarium, has lent me, I have prepared illustrations of the disease and its progress in the potato plant. With the enlarged microscopic views I will quote the descriptions given by Professor Johnson himself, when showing these slides at the Dublin Tercentenary Conference. He said :—

We must now pass on to the consideration of the potato plant in a state of disease. One well-recognised physiological distinction between a green

FIG. 2.—Potato leaf attacked by potato disease.

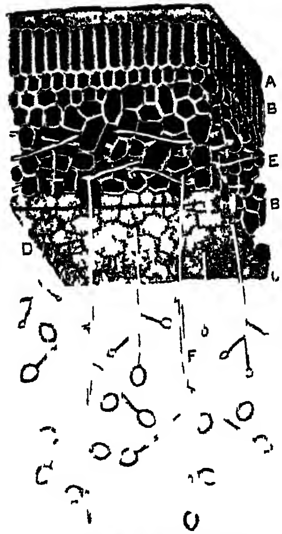

FIG. 1.—Section of leaf showing distribution of fungal threads of potato disease.

plant and a fungus is this, that a green plant can make organic substances, such as starch, out of the inorganic substances, carbonic acid and water; that a fungus, having no chlorophyll or leaf-green, cannot do this, but must obtain its starch-like bodies ready made from living animals or plants (when the fungus acts as a parasite) or from dead animals or plants, or parts of them when the fungus acts as a saprophyte). The ordinary potato fungus, *Phytophthora infestans*, is a parasite taking for the support of its own life the starch made by the potato plant for itself. One of the most interesting features in nature is the existence of the wonderful adaptation parasites, harmful as they are, show to enable them to live their lives as successfully and effectively as independent green plants do. The potato fungus finds itself, so to speak, in its host, the potato plant, in the possession of an exceedingly rich and abundant supply of food ready to hand. Accordingly, it makes the amplest provision for the production of fresh generations of

itself Let us follow out the story of the life of the fungus by the help of the illustrations.

Fig 30 In our first picture we see a potato leaf as attacked by the fungus In such a leaf the fungus is present, and is sending delicate branching living threads in all directions, through the substance of the leaf, tapping the cells of the potato leaf of their food, and, worse still, destroying the leaf-green of these cells.

Fig 31 In our next we have an illustration of these fungal threads at their destructive work In a diseased potato plant these threads or

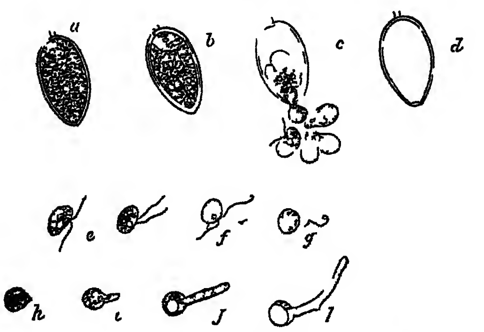

Fig 32 —Germination of spores of potato disease

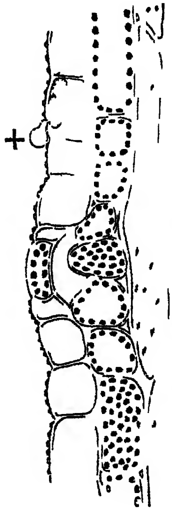

Fig 33—Section of potato stalk with germinating zoospore

mycelial hyphæ, as they are botanically called, run through the substance of the leaves, the pith, and other parts of the haulms, down into the tubers, where they play havoc with the potato plant's food stored there

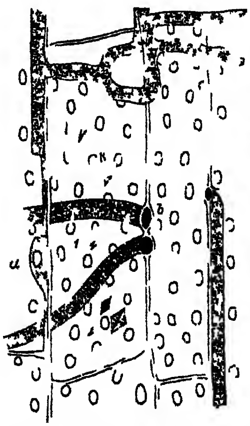

Fig 34 —Section of potato stalk with hyphæ

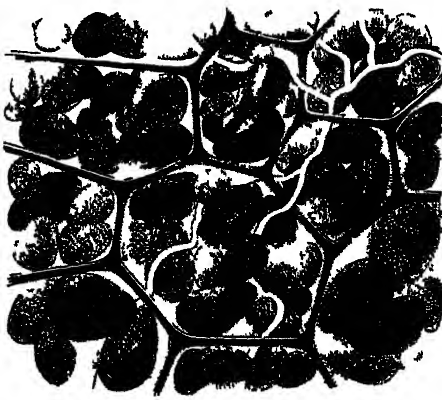

Fig 35 – Section of diseased tuber showing hyphæ

Fig. 32 exhibits the various stages of germination of one of the conidia of Phytophthora: (*a*) the ripe conidium in water, (*b*) protoplasmic contents breaking up into blocks, which separate and escape (*c* and *d*) as minute

kidney-shaped zoospores (*e*) each with two cilia; (*f* and *g*) the zoospore coming to rest and losing its cilia; (*h*, *i*, *j* and *k*) successive stages of germination of the zoospore.

Fig. 33. A longitudinal section of potato-stalk, with germinating zoospore, the germ-tube of which has pierced the cell-wall, and is growing inside the cell, as shown at +.

Fig. 34. Another piece of tissue of the stem of a potato-plant, showing the hyphæ of Phytophthora running in the cell-walls, (*a*) nucleus of a cell; the other contents shown are crystals and chlorophyll corpuscles.

Fig. 35. Section of a diseased potato tuber: A, the cell-walls; B, the starch grains; C, the mycelial hyphæ.

Potato growers know that the presence of disease in a crop can be detected at the tops of the haulm, which are first affected. So suddenly, however, are crops smitten that a grower may during an evening walk over his fields observe no indication of disease, and yet the next morning find large breadths showing the well-known signs. As to the period of growth when disease may be looked for, no definite rule can be stated. The date depends on the locality, the variety, and the general conditions of culture. During the recent season, when (June 27, 1898) passing through the fields in Jersey, where crops were being lifted, the peculiar odour of the disease was prevalent, and considerable injury to the crop was noticeable at that early date. In Ayrshire, a fortnight later, the haulm showed evidence that the attack had commenced, although several farmers had not then observed it.

In the potato districts of Dunbar, Yorkshire, Lincolnshire, &c., where late sorts are grown, no trace of disease would be expected before the middle of August, and as a rule not until the end of that month or the beginning of September. It may be assumed that disease does not become serious until the crop is approaching maturity, and as the time of ripening differs, the appearance of disease will correspond. Again, disease is seldom or never virulent unless the weather be wet or close; hence those potatoes which ripen early, when dry weather usually prevails, will be far less likely to suffer than later sorts which ripen in September or October.

As an indication of the extraordinary effect of the spread of disease through unfavourable climatic influences, it is remarkable that, although in the United Kingdom the area planted in 1894 was only slightly exceeded in 1895, the yield rose from a little over 4½ million tons to rather more than 7 million tons—an increase of 2½ million tons. This sudden increase resulted in prices which were utterly unremunerative to growers.

Disease Prevention.

At the present time *Phytophthora infestans* is fought chiefly by spraying and by the raising of disease-resisting seedling potatoes. Other minor remedies have been suggested and employed, but they are almost or entirely valueless in face of any extensive visitation of the disease I allude to such practices as pulling up the haulm or shaws directly the disease appears, and to the Jensen system of earthing up potatoes. By the former the disease is sometimes checked, although this is not always the case, as the fungus may have already made its way down to the tubers. If the crop is not fully matured the growth of the tubers is arrested, so that the weight must be reduced and the table quality will not be good.

The Jensen system consists of covering the potatoes very deeply with soil when growing; and before the disease appears the haulm is bent down into the furrows or trenches between the rows, and covered with sufficient earth to prevent recovery to an upright position. It was supposed that by this means the progress of the disease from the leaves might be arrested, but the practice was never very successful, and it is now seldom if ever adopted.

Other precautionary measures have been strongly advocated, but with very doubtful results. It has been assumed that the resting spores from a diseased crop may infect a potato crop grown on the same land in the following year. In actual practice, however, it is found that in localities specially suited to potatoes the same land is used year after year for 10, 20, and even 40 years in succession; yet in one year the crop may be devastated and in the following season be almost or entirely free from disease, although the diseased haulm was never removed from the field. On the other hand, where every possible precaution has been taken—land on which potatoes have not been grown for many years, planted with seed taken from a crop in which there was no sign of disease either before or after lifting—the resulting crop may be the first in the district to be "struck."

With all due deference to those who approach the question from a purely scientific standpoint, it is quite an open question whether disease is more likely to recur on a suitably manured field in which disease has formerly been prevalent than to appear on soil which has not grown potatoes before.

Spraying.—The system of spraying crops of potatoes while in growth with the mixture known as *bouillie bordelaise* originated in France, the object being to fortify the plant against the insidious attacks of *Phytophthora infestans*. So much public

interest has been manifested in the experiments conducted at the Reading trial ground that a summary of the facts may be acceptable to the readers of the Journal.

The mixture employed was that recommended by the Board of Agriculture, viz.:—Sulphate of Copper 20 lb., Lime 10 lb., Water 100 gallons.

Every possible care was taken to ensure the ingredients being of the best quality. The lime was freshly burnt and then slaked before mixing with the sulphate of copper.

The spraying was effected by means of the Éclair knapsack machine, but for field operations the Strawsonizer is available.

It was found that in the first and second early varieties no

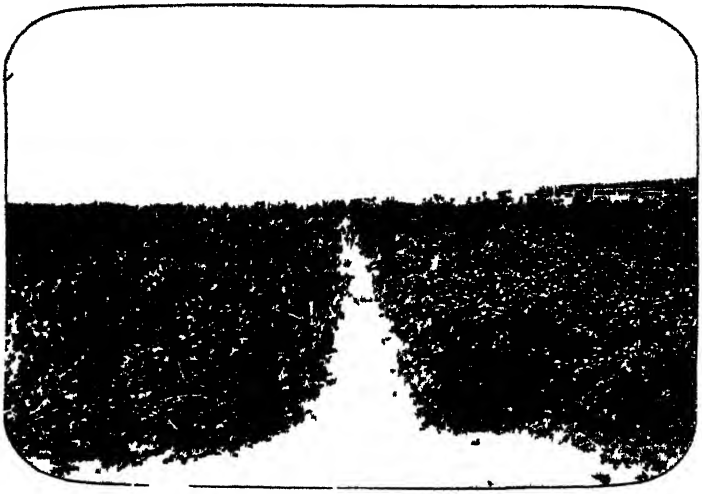

Fig. 36.—Unsprayed and sprayed Potato plots.

advantage was gained by spraying. These crops finished their growth before disease could attack the plants, and the dressing did not appreciably lengthen the period of growth; in fact there was an actual loss on the sprayed plots.

Fig. 36 shows two equal plots of Magnum Bonum potato growing side by side in 1895; that on the right-hand side having been sprayed three times, and that on the left hand not having been sprayed at all. It will be seen that the effect was very marked. The growth of the sprayed plants continued some time after the unsprayed portion had died down. The weights of the two plots when lifted were:—The sprayed, 3 cwt 1 qr. 25 lb., and the unsprayed, 3 cwt. 1 qr. 4 lb.

Strange to say, the quantity of diseased tubers was precisely the same in both plots, viz. 4 lb.

During the next season, 1896, these experiments were continued, with the result that in the case of a late Maincrop Potato there was a gain of 6 cwt. 3 qrs. 4 lb. per acre—but exactly the same spraying applied to White Elephant gave a loss of 12 cwt. 2 qrs. 0 lb.

In 1897 two sorts of potatoes were experimented upon, viz. White Elephant and Magnum Bonum. White Elephant showed a loss on the sprayed, as compared with the unsprayed, of 13 cwt. 24 lb. per acre. With Magnum Bonum, the loss per acre worked out at 2 cwt. 96 lb. These results indicate that the later crops, where they are not benefited by the spraying, are not equally reduced in weight as compared with the early and second early crops.

Another experiment was conducted in 1898 with the object of ascertaining the effect of spraying White Elephant potato in comparison with Flourball. In this trial the loss on White Elephant amounted to 4 cwt. 32 lb., while Flourball showed a gain of 7 cwt. 16 lb. per acre.

Just as my paper was being despatched, I received a very interesting report from Professor Carroll, of the Albert Model Farm, Glasnevin, on the results of spraying potatoes in Ireland. The letter indicates such a keen public interest in the subject, that I am glad to have the opportunity of placing Professor Carroll's own words before the readers of the Journal:—

In reply to your inquiry regarding results of spraying potatoes in Ireland during 1898, I am pleased to inform you that this year appears to have increased the number of those who have faith in the process. The extent of crop sprayed this year is, I calculate, quite double of the area sprayed last year, and it is noticeable that those districts which require most attention in this respect, viz. the west and south-west districts, have increased in the largest proportion. Indeed, so eager were the people of remote localities to adopt this preventive that improvised appliances were used when the spraying machine could not be had. It was amusing to witness the ingenious devices of some of the peasants in these cases: heather brooms, whitewash brushes, and occasionally 'wisps' of straw tied on the end of a piece of wood might be seen in use, and what was lacking in scientific application was compensated for by the large quantity of the spraying mixture that was applied.

The Congested Districts Board and the Local Government Board gave timely help in the poor districts, but the extraordinary increase in the demand for spraying machines and material for spraying was such that the authorities were in many cases unable to help to the fullest extent. It was pleasant to notice the intelligent way in which the work was done generally: directions were fully carried out, and in several instances the peasants left a small portion of the crop unsprayed in order to test the efficacy of the process.

As is usually the case in the time of "blight," the western districts of Ireland were most affected by it. The midland counties were less affected, and the eastern seaboard was comparatively free. The crop generally is this year a heavy one. and there will be a large crop well saved. I expect that the spraying of potatoes will in future be very generally practised in Ireland.

It may interest you to know that the Commissioners of National Education have for some years past sent to teachers of National Agricultural Schools (about 45 in number) several varieties of potatoes for experimental purposes, and for the purpose of distributing in their districts such varieties as appear to be adapted to the district; by this means it is hoped that good varieties may be introduced, and where a variety is well suited to the circumstances of a district it is expected that it will grow into favour and be serviceable to the peasantry.

Raising Seedlings.—From the records of experiments made by others, and from my own experience, I have been driven to the conclusion that no external treatment has yet proved to be a reliable antidote to the Phytophthora. This opinion is confirmed by the fact that growers cannot do more than maintain, for a longer or shorter period, the vigour with which any given potato starts its career. The recorded lists of potatoes for the past century show that changes are constantly occurring. One after another, favourite potatoes cease to be grown. The duration, just as in human life, depends on inherited constitution and favourable environment. For a time the introduction of Magnum Bonum created a belief in a disease-proof potato. The term "disease-resisting" is preferable, and the degree of resistance at present depends on the constitution of the seedlings. By no means yet discovered can a fully matured potato be permanently strengthened in constitution. But we have the open door of new varieties, raised from robust parents. And should these new and constitutionally strong potatoes become the rule instead of the exception, we may hope that the ravages of disease will be more and more reduced. To obtain such seedlings is no easy task. The problem of acclimatisation is alone sufficiently formidable. If pursued for its own sake, regardless of other points, possibly a very robust stock might be raised, but even this would be too dearly won by the sacrifice of free-cropping table quality, and other characteristics which give the potato its value.

Before describing the method of raising seedlings it is desirable to prevent the possibility of a misunderstanding. Seed potatoes have occasionally been confused with potato seed. "Seed Potatoes" are grown from true and reliable stocks, the crops being carefully examined year after year with the special object of ensuring the perpetuation, unmixed, of any given variety. Frequently the tubers of an ordinary crop, which are

too small for market, are kept back for planting, and where the stock is perfectly true and has not been grown on the same land too long, many farmers adopt this plan rather than go to

FIG. 37.—Potato flower

the expense of purchasing fresh seed. "Potato seed" is totally different, being the seed formed in the potato berries which some, though not all, varieties of potatoes bear freely.

The well-known potato flower is illustrated in fig. 37. In fig. 38 the potato flower is shown with the anthers, &c., removed, leaving only the pistil. In artificial crossing it is necessary to remove the anthers at a very early stage, to prevent the pistil being impregnated with pollen from its own anthers. Fig. 39 shows a bunch of berries in their natural condition, whilst fig. 40 is an illustration of part of a single berry in sections. A berry may contain from 100 to 300 seeds,—the average of five berries examined was 232. As all the different seeds from one potato berry may produce plants differing one from another, not only in form, but many of them in colour also, here arise the possibilities of improving the race by selection of the better seedlings. Even if no cross-fertilisation of flowers be

FIG. 38.—Potato flower with anthers removed.

attempted, great improvement may be made by the selection of the most promising seedlings during the first few years of their existence. And where judicious crossing of the best known varieties is undertaken, the merits of both male and female parents may in a measure be combined, although even then probably no two seedlings from the same berry will be exactly alike.

Fig. 41 shows the growth of a potato seedling at the end of the first year. In this case the flower was fertilised in the

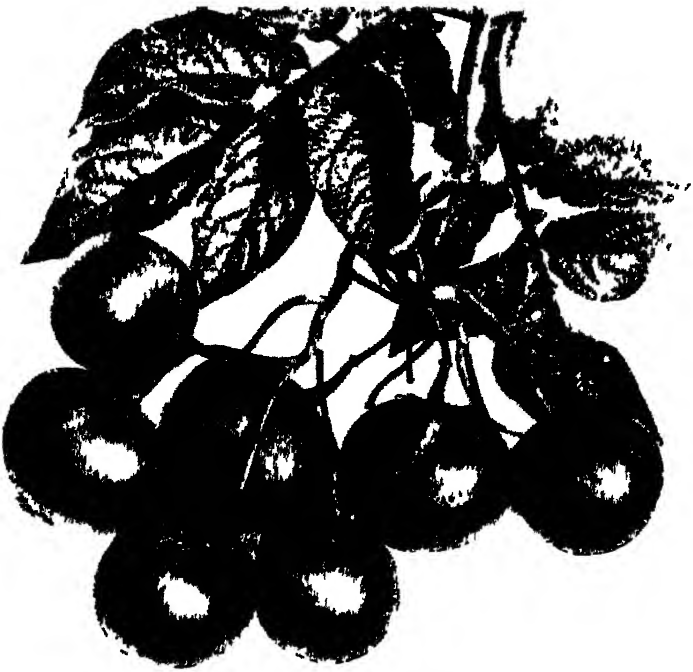

FIG. [illegible].—Potato berries and foliage

summer of 1894, and the seed was sown in the spring of 1895. The photograph was taken in September of the year last named.

Fig. 42 exhibits a seedling in its third year. This illustration indicates the gradual maturing of the tubers into a fixed and regular type. Not until the fourth or fifth year is it possible to judge how far the character of a seedling is fixed or not.

Those who attempt to raise seedling potatoes must possess abundant patience. Like many other species which are not habitually multiplied by seed, the potato has a remarkable

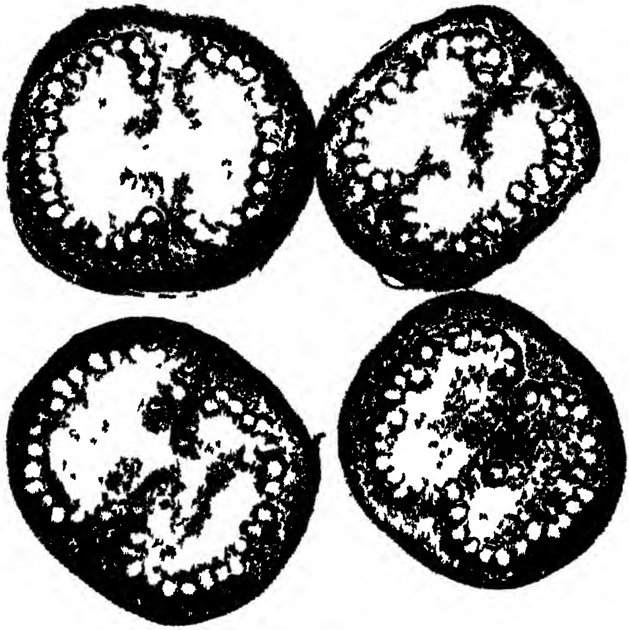

FIG 40—Section of Potato berry (Enlarged)

FIG 41—Potato seedling first year

tendency to revert to the wild form. It may be necessary to cultivate a thousand seedlings before finding one which is really worthy of a place amongst the better varieties already existing.

M. de Vilmorin tells me that while we in England have followed a systematic method, seeking especially richness in starch, excellence of flavour, power of resisting disease, and avoiding the tendency to develop haulm at the expense of the tuber, the raising of seedlings in France has been conducted in a some-

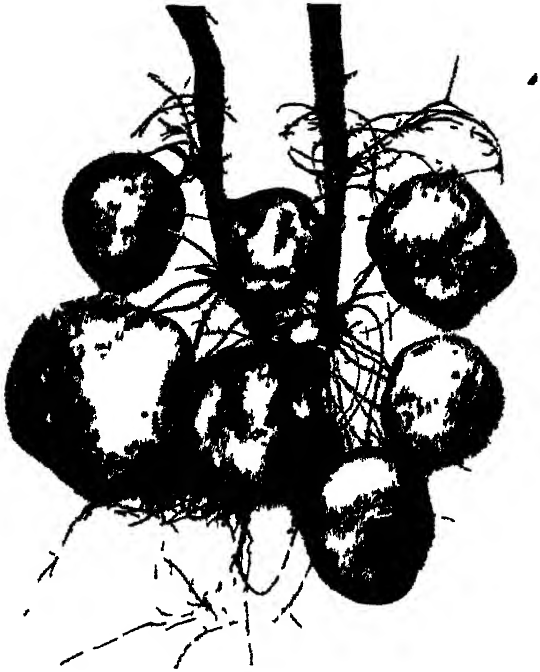

FIG. 42.—Potato seedling third year.

what haphazard manner. Unfortunately, he says, they are not always able to profit in France by our progress, because the French have a marked partiality for potatoes with yellow flesh, whereas with us, for many years past, there has been a preference for white-fleshed potatoes. M. de Vilmorin also remarks that in Germany considerable attention has been given to the raising of seed potatoes, more particularly with the object of obtaining varieties which are specially adapted for the production of alcohol and starch

MODERN INTRODUCTIONS.

English potato growers are indebted to the lifelong labours of such men as the late James Clark, of Christchurch, Hants, who raised the following amongst other standard varieties (most of which I have myself been responsible for introducing):—

Magnum Bonum,	Invincible,	Nonsuch (fig. 44),
Supreme,	Ninety-fold,	Ideal,
Sutton's Seedling,	Abundance,	Satisfaction,
Reliance,	Windsor Castle (fig. 43),	Maincrop Kidney;

to the veteran, Mr. Robert Fenn, of Sulhampstead, Berks, whose best known seedlings are Ringleader (fig. 45), Early Regent, and Reading Russet; to Mr. Shakeshaft, of Lymm, Cheshire, who

FIG. 43.—Windsor Castle.

raised Harbinger, which has taken so prominent a place in Ayrshire; and to Mr. Charles Ross, Mr. A. Dean, and others, whose attention has chiefly been devoted to the raising of garden potatoes.

Credit is also due to Mr. A. Findlay, of Markinch, for introducing one of the heaviest cropping potatoes of the day, viz. Up to Date, as well as British Queen, Jeanie Deans, and Challenge; and to Mr. C. Fidler, of Reading, who has introduced Reading Giant, Colossal, and Queen.

Honourable mention must further be made of the excellent work done by the late Shirley Hibberd, who, although not a

Fig. 44.—Nonsuch

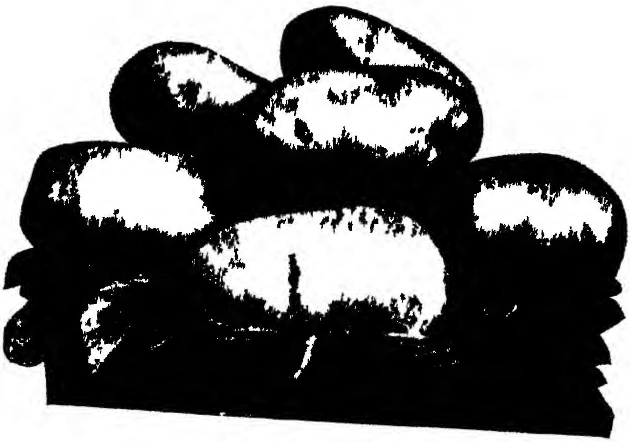

Fig. 45.—Ringleader

raiser of potatoes, played a no less important part in testing the comparative merits of seedlings as they appeared, and it was in his garden at Stoke Newington that the experiments were conducted which resulted in the Magnum Bonum potato being introduced to the public by my father.

Amongst other potatoes which have taken a prominent place in recent years, as a result of hybridisation, the following deserve mention:—

Early Puritan . .	(from America).
Snowdrop . . .	(introduced by Perkins of Northampton).
Beauty of Hebron . .	(from America).
" (White)	
The Saxon . . .	(from Germany).
Early Rose . . .	(one of the first introductions from America, and now exported in large quantities for planting in South Africa).
Schoolmaster . .	(introduced by Turner).
Victor	(introduced by Sharpe).

The Manuring of the Potato Crop.

During the four seasons 1895 to 1898 inclusive elaborate field experiments on the manuring of potatoes have been made at our trial grounds in connection with Reading College. The results of these experiments are of a striking character, and show in a forcible manner how systems of manuring potatoes should vary according to the soil, the climatic conditions, the kind of potato, and the previous treatment of the land.

The objects of the experiments have been to ascertain the relative effects of farmyard and artificial manures; to compare the results of applying the manures in the early winter and at the time of planting; and to discover what combination of artificial manures is best suited for the potato crop.

In the first season, 1895, 100 plots, each $\frac{1}{40}$ acre in area, were grown, but the results were not published, as owing to the exceptionally dry season the crop throughout was unsatisfactory.

In the second season, 1896, potatoes were again grown on 20 of the plots started in the previous year, and also on 40 new plots of the same area.

In the third season, 1897, the 20 plots commenced in 1895 were still continued, and in addition to this 28 plots on fresh ground were commenced.

In 1898, the fourth season, trials have been made on 26 plots, each $\frac{1}{32}$ acre in extent, on land not previously under experiment.

The soil is free and gravelly, and lies on a subsoil of gravel. An analysis of it is subjoined, the figures indicating a fair proportion of phosphoric acid, but rather a deficiency of the other valuable ingredients. It was further ascertained by Dr.

Dyer's method of analysis that ·054 per cent. of phosphoric acid and ·0241 per cent. of potash were present in a soluble condition. This nearly corresponds with the proportions found by him to be present in a plot in Hoos field, at Rothamsted, which had been continuously manured for a long series of years:—

Insoluble constituents	87·5	Phosphoric acid	·37
Oxide of alumina	1·93	Sulphuric acid	·02
Oxide of iron	4·42	Carbonic acid	·1
Manganese	·2	Chlorine	·008
Magnesia	·1	Organic matter and water of combination	4·25
Lime	·8	containing nitrogen	·1
Potash	·17		

In the accompanying tables (pp. 617–619) some of the results of these experiments are recorded.

Table I. shows that most of the manures applied in 1895 gave excellent results in the second and third years after their application. It has also been found that with a dry soil and climate there is a probability that the residues of previous manurings are much more efficacious than direct manuring for potatoes. In these circumstances therefore the generally useful plan of manuring each season for each successive crop may be wrong, and the older one of getting the soil into a high condition far more useful.

The striking general result shown in Table II. is that consecutive manuring for three years has given a smaller increase of the potato crop than when the manures were applied in the first year only. Plot 3 is the only exception to this. It will be seen that with consecutive manuring the best results have been obtained where the double dressings of nitrate of soda were applied, namely on Plots 5 and 7. As the annual cost of the manures in this case has to be multiplied by three, and the actual increase from the manures is less than shown in Table I., this plan of manuring has not been profitable.

Two sets of experiments were made during 1897 to test the relative advantages of applying manures to the potato crop in the early winter and at the time of planting. These, however, gave no sharply defined results, the effects of the manures being very similar, although applied at different times.

The two sets of experiments, the results of which are given in Table III., were made during 1898 on land not previously under experiment. The plots were each $\frac{1}{32}$ acre in area. Peas were grown on the soil in 1897, swedes in 1896, and peas in 1895, none of these crops being manured. The soil, therefore, in this case was in poorer condition than in any of the previous experiments, as it had not received any manure during the pre-

Table I.—*Potatoes grown during Seasons* 1895, 1896, *and* 1897, *and manured in* 1895 *only. Results per acre.*
(Results not given for 1895 owing to drought.)

Plot	Manures applied 1895 only	Cost of manure £	s.	d.	1896 Flourball tons	cwt.	lb.	1897 Flourball tons	cwt.	lb.	Increase of marketable tubers in 1896 and 1897 over unmanured plot tons	cwt.	lb.	Value of increase at 60s a ton £	s.	d.
		Weight of marketable tubers (weight of small tubers given underneath within brackets)														
1.	No manure	—			6	2	56	4	16	88	—			—		
					(0	7	76)	(0	10	81)						
2. Farmyard only	30 tons farmyard manure	7	10	0	7	5	40	5	15	40	2	1	48	6	4	4
					(0	5	20)	(0	11	88)						
3. Farmyard and complete artificials	30 tons farmyard manure 2 cwt. nitrate of soda (two dressings) 2 cwt. superphosphate 1½ cwt. sulphate of potash	9	5	6	6	3	104	5	10	40	0	15	0	2	5	0
					(0	5	60)	(1	0	0)						
4. Complete artificials (normal)	2 cwt. nitrate of soda (two dressings) 2 cwt. superphosphate 1½ cwt. sulphate of potash	1	15	6	6	5	40	5	3	24	0	9	32	1	7	10
					(0	4	12)	(0	17	96)						
5. Complete artificials (double dressing)	4 cwt. nitrate of soda (three dressings) 4 cwt. superphosphate 3 cwt. sulphate of potash	3	11	0	8	1	8	5	8	24	2	10	0	7	10	0
					(0	6	108)	(0	18	24)						
6. Complete artificials (half dressing of nitrate)	1 cwt. nitrate of soda (one dressing) 2 cwt. superphosphate 1½ cwt. sulphate of potash	1	6	0	8	11	48	5	15	0	3	7	16	10	1	5
					(0	5	80)	(0	16	48)						
7. Complete artificials (double dressing of nitrate)	4 cwt. nitrate of soda (three dressings) 2 cwt. superphosphate 1½ cwt. sulphate of potash	2	11	6	7	13	24	5	4	32	1	18	24	5	14	8
					(0	5	100)	(0	15	0)						
8. Potash omitted	2 cwt. nitrate of soda (two dressings) 2 cwt. superphosphate	1	5	0	8	0	0	5	11	88	2	12	56	7	17	6
					(0	9	72)	(0	17	56)						
9. Phosphate omitted	2 cwt. nitrate of soda (two dressings) 1½ cwt. sulphate of potash	1	9	6	8	3	24	5	6	8	2	10	0	7	10	0
					(0	8	4)	(0	15	80)						
10. Nitrogen omitted	2 cwt. superphosphate 1½ cwt. sulphate of potash	0	16	6	7	17	16	4	12	16	1	10	0	4	10	0
					(0	9	52)	(0	15	80)						

TABLE II.—*Potatoes grown during Seasons* 1895, 1896, *and* 1897, *and manured in* 1895, 1896, *and* 1897. *Results per acre.*
(Results not given for 1895 owing to drought.)

Plot	Manures applied annually, 1895–97	Annual cost of manures	Weight of marketable tubers (weight of small tubers given underneath within brackets): 1896 Flourball	1897 Flourball	Increase in weight of marketable tubers in 1896 and 1897 over unmanured plot	Value of increase at 60s. a ton
		£ s. d.	tons cwt. lb.	tons cwt. lb.	tons cwt. lb.	£ s. d.
1.	No manure	—	7 16 8 (0 10 80)	5 1 48 (0 19 32)	—	—
2. Farmyard only	30 tons farmyard manure	7 10 0	7 19 32 (0 10 42)	6 0 0 (0 14 32)	1 1 88	3 5 5
3. Farmyard and complete artificials	30 tons farmyard manure 2 cwt. nitrate of soda (two dressings) 2 cwt. superphosphate 1½ cwt. sulphate of potash	9 5 6	7 18 64 (0 8 24)	6 10 0 (0 16 8)	1 11 8	4 13 3
4. Complete artificials (normal)	2 cwt. nitrate of soda (two dressings) 2 cwt. superphosphate 1½ cwt. sulphate of potash	1 15 6	6 17 96 (0 9 12)	5 15 40 (0 15 80)	—	—
5. Complete artificials (double dressing)	4 cwt. nitrate of soda (three dressings) 4 cwt. superphosphate 3 cwt. sulphate of potash	3 11 0	8 9 72 (0 6 68)	6 17 16 (0 16 88)	2 9 32	7 7 10
6. Complete artificials (half dressing of nitrate)	1 cwt. nitrate of soda (one dressing) 2 cwt. superphosphate 1½ cwt. sulphate of potash	1 6 0	7 12 56 (0 6 108)	6 1 48 (0 11 88)	0 16 48	2 9 4
7. Complete artificials (double dressing of nitrate)	4 cwt. nitrate of soda (three dressings) 2 cwt. superphosphate 1½ cwt. sulphate of potash	2 14 6	8 9 72 (0 5 40)	7 0 40 (0 18 24)	2 12 56	7 17 6
8. Potash omitted	2 cwt. nitrate of soda (two dressings) 2 cwt. superphosphate	1 5 0	7 16 48 (0 5 20)	6 18 24 (1 3 24)	1 17 16	5 11 5
9. Phosphate omitted	2 cwt. nitrate of soda (two dressings) 1½ cwt. sulphate of potash	1 9 6	7 19 72 (0 4 72)	7 1 48 (1 3 24)	2 3 64	6 10 9
10. Nitrogen omitted	2 cwt. superphosphate 1½ cwt. sulphate of potash	0 16 6	5 12 96 (0 3 104)	4 13 24 (1 2 16)	—	—

TABLE III.—*Flourball Potato grown during* 1898. *Results per acre.*

Plot	Manures	Cost of manures			Weight of marketable tubers (weight of small tubers given underneath within brackets): Set I			Set II			Selected plots not so much affected with drought			Increase of marketable tubers in selected plots over unmanured plot			Value of increase at 60*s.* a ton		
		£	*s.*	*d.*	tons	cwt.	lb.	tons	cwt.	lb.	tons	cwt.	lb.	tons	cwt.	lb.	£	*s.*	*d.*
1	No manure		—		5	16	96	5	18	0	5	18	0		—			—	
					(0	10	96)	(0	8	0)	(0	8	0)						
2	20 tons farmyard manure	5	0	0	6	8	0	5	14	96	6	8	0	0	10	0	1	10	0
					(0	12	0)	(0	10	96)	(0	12	0)						
3	20 tons farmyard manure 2 cwt. nitrate of soda 3 cwt. superphosphate 1 cwt. sulphate of potash	6	17	3	6	12	64	8	3	16	8	3	16	2	5	16	6	15	5
					(0	12	96)	(0	8	32)	(0	8	32)						
4	2 cwt. nitrate of soda 3 cwt. superphosphate 1 cwt. sulphate of potash	1	17	3	5	18	0	7	14	64	7	14	64	1	16	64	5	9	9
					(0	10	0)	(0	11	16)	(0	11	16)						
5	4 cwt. Damaraland guano 1 cwt. sulphate of potash	2	10	0	5	10	0	6	14	106	6	14	106	0	16	106	2	10	10
					(0	11	16)	(0	10	32)	(0	10	32)						
6	2 cwt. nitrate of soda 3 cwt. superphosphate	1	5	3	5	9	48	7	16	96	7	16	96	1	18	96	5	16	8
					(0	8	64)	(0	14	0)	(0	14	0)						
7	2 cwt. nitrate of soda 1 cwt. sulphate of potash	1	9	0	5	19	48	6	5	80	6	5	80	0	7	80	1	3	3
					(0	9	48)	(0	13	80)	(0	13	80)						
8	3 cwt. superphosphate 1 cwt. sulphate of potash	1	0	3	6	11	80	5	8	64	6	11	80	0	13	80	2	1	3
					(0	6	96)	(0	13	80)	(0	6	96)						
9	2 cwt. nitrate of soda 2 cwt. superphosphate 1 cwt. muriate of potash	1	14	9	6	5	16	5	5	16	6	5	16	0	7	16	1	1	5
					(0	9	16)	(0	14	0)	(0	9	16)						

ceding three years. A partial analysis of this soil has been made by Dr. Luxmoore, who found that ·014 per cent. of phosphoric acid and ·04 per cent. of potash were present in an easily soluble form, and that the proportion of nitrogen present in the soil was ·112 per cent. The above figures indicate that the soil is considerably poorer in soluble phosphoric acid and richer in soluble potash than the soil on which the experiments were commenced in 1895. Most of the plots on Set I., and some on Set II., suffered very considerably from the exceptional drought during the last half of the summer; the selected plots, however, did not suffer so much, and a comparison of these is a fair one, with the exception of Plot 9, which was probably affected more than the others by drought. The manures were all applied at the time of planting, except the nitrate of soda, which was added afterwards as a top dressing. The best economical result has been given by the combination of artificial manures applied to Plots 4 and 6. and here again the crop is better on Plot 6 where potash is withheld than on Plot 4 where it is included in the dressing.

The experiments of the past four years show that small results were obtained by direct application of manures to the potato crop, in a district with a dry soil and limited rainfall. Potatoes are most successfully grown on land in high condition; this is fully borne out by the results on Table I., and the results on Table II. indicate that on such high-conditioned land the direct application of many artificial manures for potatoes will do harm rather than good. Tables II. and III. rather tend to show that there is not much to choose between applying manures in the early winter and at the time of planting. It has been very striking all through the experiments that nitrate of soda has had far more effect in increasing the luxuriance of the haulm than the weight of the tubers. Another result of the experiments is that potash manures have not had the effect of increasing the crop to the extent anticipated when the investigations were commenced. It is also noticeable that farmyard manure has with few exceptions failed to give satisfactory results; this is in all likelihood due to this manure keeping the soil drier and thus intensifying the effect of dry seasons, and partly also to the land having been heavily dressed with farmyard manure in previous years.

Rothamsted Experiments.—Reference should here be made to the experiments and investigations on the manuring of potatoes made during the past twenty-three years at Rothamsted by Sir John Lawes and Sir Henry Gilbert.

In the summary tables issued from Rothamsted in 1898 it

is stated that the average crop per acre for the twenty years 1876–1895, with the same manures applied annually, is as follows:—No manure, 1 ton 11½ cwt.; 14 tons farmyard manure (with the addition of superphosphate before 1883), 5 tons 2 cwt.; where superphosphate only was used the average crop was 3 tons 2¼ cwt.; and mixed mineral manure including superphosphate and sulphate of potash gave on the average 4½ cwt. more than superphosphate only. Further, nitrate of soda and mixed mineral manure gave the best average for these years, viz. 6 tons 1¾ cwt.; where ammonia salts were added to mixed mineral manure instead of nitrate of soda the average result was less by 2¾ cwt. per acre.

In two important points the Reading results agree with those at Rothamsted: (1) the addition of a potash manure to superphosphate has not materially increased the crop, (2) farmyard manure has not given as good results as a judicious application of artificial manures. It should also be noted that the nitrate of soda has given a better result than ammonia salts including sulphate of ammonia containing the same amount of nitrogen.

The following extracts are from the annual report on the Rothamsted experiments issued in 1898:—

> The percentage of nitrogen in potato tubers is much increased by the application of nitrogenous manures, but the less so the riper the crop.
>
> The characteristic effect of nitrogenous manures, provided there be a sufficient available supply of ash constituents, and especially of potash, is to increase the amount of the non-nitrogenous substance—starch—in the tubers. . . . Indeed, it is for the production of the non-nitrogenous substances—starch, sugar, and cellulose—that our direct nitrogenous manures are chiefly used.

The report also states that nitrogenous manures, while producing the most luxuriant growth, give the greatest proportion of diseased tubers when disease is present.

The Composition and Comparative Feeding Value of Potatoes.

The composition and feeding value of potatoes may be conveniently considered under four heads, namely (1) water and dry substance; (2) starch, sugar, &c.; (3) nitrogenous constituents; (4) compounds found in the ash. The following figures, taken from Kreusler's analyses recorded in the "Landwirtschaftliches Jahrbuch" 1886, may serve to give a general idea of the composition of potatoes:—

	per cent. A		B		per cent. of dry substance A		B	
Starch	23 89		15·87		76·18		71·49	
Dextrin	·49		·00		1 57		·00	
Mucilage &c.	2·43		2·01		7·75		9 07	
Total soluble non-nitrogenous substance	26 82		17·88		85·50		80·56	
Fat	·07		·06		·22		·27	
Cellulose &c.	·67		·54		2·13		2·44	
Total non-nitrogenous organic substance		27·56		18·48		87·85		83·27
Albuminoids	1·86		1·75		5·93		7 89	
Amides &c.	·70		·95		2·26		4 37	
Total nitrogenous substance		2·56		2·70		8 19		12·26
Ash constituents		1 25		·99		3·96		4 47
Total dry substance		31·37		22·17		100 00		100 00
Water		68 63		77 83				
		100 00		100 00				

Water and Dry Substance.—The proportion of water in potatoes varies in extreme cases between 65 and 85 per cent., but in general ranges from 70 to 80 per cent., so that the dry substance amounts to from 20 to 30 per cent.; about 25 per cent. may be taken as the mean.[1] This is considerably more dry substance than is contained in root crops generally, and the variation is also wider than these, as the following figures show:—

Dry substance in

White Turnips	7–9 per cent.	Sugar Beet	16–19 per cent.
Swedes	10–12 „	Potatoes	20–30 „
Mangels	12–15 „		

The percentage of dry substance in potatoes depends in part upon the variety and is influenced by the nature of the manuring and other causes, but is especially dependent on the character of the season. The wetter seasons are more conducive to luxuriance of vegetative growth, whilst drier weather tends to favour earlier maturation of the product, with a consequent increased percentage of dry substance. The higher proportion of dry substance in the more fully matured tubers is due to an increased percentage of starch, and is always indicated by a higher specific gravity. Tables have been given for the calculation of dry substance and of the starch from the specific gravity of the tubers, which it is a very simple matter to determine with approximate accuracy. The relations given in Wiley's "Agricultural Analysis"

[1] The figures given as mean values are in round numbers, so as to convey a general idea of the composition. For more accurate values detailed analyses must be referred to. A lecture on "Results of Experiments at Rothamsted on the Growth of Potatoes," by Sir Henry Gilbert, contains a great amount of information on this subject, and many of the figures here given are taken from it.

do not indeed agree with the results obtained by Lawes and Gilbert (*loc. cit.*), probably through a difference in the method by which dry substance and starch were determined. The figures given by Sir Henry Gilbert lead to the following rule for obtaining the dry substance from the specific gravity. Take the three figures of the specific gravity which follow the decimal point (that is, the weight of 1,000 parts when weighed in water), multiply by 2, add 40, and divide by 10. The following examples show that this will give the percentage of dry substance correct in the units:—
Specific gravity 1·100; $100 \times 2, + 40, \div 10 = 24$; the actual percentage was 24·4. Specific gravity 1·112; $112 \times 2, + 40, \div 10 = 26{\cdot}4$; the actual percentage was 26·36.

It follows that the determination of the specific gravity of the tubers offers at once a ready and convenient means of determining their approximate value.

Starch.—The most important constituent of potatoes is starch. The proportion of this may fall as low as 10 per cent. in extreme cases, but generally lies between 15 and 20 per cent. of the fresh tubers, say from 70 to 80 per cent. of the dry substance. Starch is a non-nitrogenous food, and may be taken as a type of the large group of carbo-hydrates, which all serve to supply the animal body with energy that may be utilised in the form of heat, of muscular exertion, or otherwise; but they cannot form flesh or repair the waste of the tissues. Starch is insoluble in cold water, but, on heating, the granules of which it is composed swell up and burst, and the *mucilage* formed from boiled starch and water is much more readily acted on by solvent agents than are the unbroken granules. The conversion of starch into soluble carbohydrates is effected in the arts by boiling with acids, by dry-heating, and in other ways; but in the process of animal nutrition its conversion, first into maltose (malt sugar) and dextrin, and finally into glucose (grape sugar, dextrose), is effected partly by the saliva and partly by the pancreatic juice. In respect of its need for this process in order to render it capable of being absorbed by the walls of the alimentary canal, the potato is inferior as a food to such roots as turnips and mangels, in which the principal carbohydrates are soluble sugars. However, in the case of cooked tubers in which the starch granules have been broken up, the work of converting the starch into sugar cannot be regarded as a heavy tax on the digestive organs. It may be further mentioned that the dry-heating of starch to about 160° C. (230° F.) causes its conversion into dextrin, which is more easily digested than starch. Whether it would be practically useful to feed stock with potatoes cooked in this way must be left for agriculturists to decide.

The near relationship between starch on the one hand, and dextrin and various sugars on the other hand, would naturally lead one to expect to find these present in potatoes to some extent; the percentage present, however, is very small, and has little practical significance. In the case of diseased potatoes considerable quantities of starch are converted into sugar to serve as food for the fungus. The sugar in the white portion of diseased tubers, as determined by the polariscope, was found by Lawes and Gilbert (*loc. cit.*) to form a two or three times greater percentage of the fresh juice than in the case of healthy tubers of the same season.

In addition to traces of dextrin and glucose, the juice of potatoes contains a small quantity of non-nitrogenous organic substance of a mucilaginous or pectose character; whilst 1 per cent. or less of cellulose is recorded as present with the starch in the insoluble marc. Practically the whole of these substances can be digested by ruminant animals, or at any rate the indigestible portion is extremely small. The amount of fatty matter is too small to be of any importance.

Nitrogenous Constituents.—The percentage of nitrogen in potatoes is extremely variable, but is always very small. Young tubers may contain as much as 2·7 per cent. of the dry substance, that is, about 7 parts in 1,000 of the fresh weight; but as growth proceeds this rapidly diminishes, so that full-grown potatoes will contain only from 3 to 4 parts in 1,000 of the fresh weight, or say 1 to 1½ per cent. of the dry substance, or even less The proportion of nitrogen is considerably increased by the free use of nitrogenous manures; whilst on the other hand it is diminished in dry seasons and under conditions favourable to maturation. The proportion of nitrogen above given would be equivalent to from 2 to 2½ per cent. of nitrogenous substance in the fresh tubers on the supposition that this contained some 16 per cent. of nitrogen. This supposition is not far from the truth as far as albuminoid substances are concerned, but a considerable proportion of the nitrogen present is in quite a different form of combination.

It is known that nitrogen enters the roots of plants in the form of a salt of nitric acid, *e.g.* calcium or sodium nitrate: in the process of plant nutrition this is probably first converted into a particular type of organic compound known as an amide, of which asparagin may be taken as an example, and afterwards into a true albuminoid. So far as any definite evidence is obtainable, it is only in the last-named form that nitrogen is available as a constituent of food for animals. The albuminoid substances elaborated in plants are usually sufficiently allied in their chemical nature to the compounds characteristic of blood, muscle, &c., to be available for the formation of those compounds in the animal system. Amides, on the contrary, must be regarded as not sufficiently elaborated to be available as flesh formers.

Of the nitrogenous substance contained in the juice of the potato a considerable proportion consists of amides, together with some salts of ammonia and nitric acid; the remainder consists chiefly of a kind of vegetable albumen, which being soluble in water is easily digestible, but of which a portion is lost when potatoes are boiled, and especially if they are allowed to soak in water before boiling; this loss is limited to a considerable degree, however, by the retention of the skins. The nitrogenous substance in the marc or insoluble portion is almost entirely albuminoid. As to the proportion in which the nitrogen is divided between these three groups, there is a considerable difference in the results of different investigators, which is probably partly, but not wholly, due to variations in the tubers themselves.

Speaking in round numbers, we may say that about 40 per cent. of the total nitrogen, or rather less, occurs in the form of amides in the juice, about 45 per cent. as soluble albumen in the juice, and 15 per cent. is present in the marc in the form of albuminoids. To put the matter in another way, we may say that 1,000 parts of fresh tubers, containing 2½ parts of total nitrogen, will contain in the juice about 5 parts amides calculated as asparagin, and about 7 parts albuminoid substance: and in the marc rather more than 2 parts albuminoid substance.

In consequence of the great variation of the percentage of nitrogen in the potato, it is difficult to give any generally useful comparison of its value as a flesh-forming food with that of other root crops in which the proportion of nitrogen is small, and only a part of it is in the albuminoid condition; but the potato generally does contain a slightly higher percentage of albuminoid substance than turnips and mangels.

Mineral Constituents.—The constituents of potatoes found in the ash amount to about 1 per cent. more or less, that is to say, about 4 per cent. of the dry substance. The mineral constituents are present in greater

proportion when mineral manures are freely applied, and they diminish in proportional quantity as growth proceeds.

The greater part of the mineral substances is derived from the juice, the percentage in the marc being relatively small. While only 15 per cent. or thereabout of the total dry substance is contained in the juice and 85 per cent. in the marc, of the ash constituents (as well as of the nitrogen) some 85 per cent. is contained in the juice and 15 per cent. only in the marc. The mineral constituents form, indeed, nearly a quarter of the total dry substance contained in the juice.

The preponderating constituent of the ash is potash, which forms more than half its weight. The potash is accompanied by comparatively small quantities of other bases, of which magnesia and lime are the most important. Combined with these the ash contains varying quantities of phosphoric, sulphuric, and hydrochloric acids (besides carbonic acid formed in the process of incineration); the mineral acids present are only sufficient to combine with about one-third of the bases present, so that there can be no doubt that a considerable quantity of the bases must exist in the juice in combination with organic acids. Reckoning these as citric acid, there would be at least 1 per cent. present in the fresh tubers. It will be seen from the following comparison of mean results that potatoes compare favourably with "other root crops" both as to total ash and as to the two most important ash constituents:—

PARTS IN 1,000.

—	Ash	Potash	Phosphoric acid anhydride
White Turnips .	6·5	3	·8
Mangels . .	9·	4·	·8
Potatoes . .	9 5	5 5	1 2

To sum up, it may be said that whilst potatoes are somewhat richer in flesh-forming and in mineral constituents than are the ordinary root crops, their chief value lies in the considerable proportion of digestible carbo-hydrates which they contain. On the other side, it must be granted that, at any rate in an uncooked state, the starch which they contain is not in such a favourable condition for digestion as is, for instance, the sugar contained in mangels.

THE MODERN CULTURE OF POTATOES.

No crop grown in this country receives such varied treatment as the potato. The seed may be selected individually, and be carefully boxed from the time of lifting until planted by hand, or it can be riddled from the ware, either when lifted or as taken from the clamp, and be planted by machines capable of finishing nine acres per day. Definite rules cannot be laid down for universal acceptance. Methods vary in accordance with climate, district, soil, and especially in relation to the needs of the market which the grower aims at supplying. The early market first claims attention, and, did space permit,

it would be interesting to glance at the practice of other nations.

Messrs. W. J. Coleman & Sons, the well-known importers, tell me that in some seasons hundreds of tons of new potatoes from the Canary Islands are on the London market in November, and then realise from 14*l.* to 28*l.* per ton. Crops from Guernsey, grown under glass, follow, and these are succeeded by consignments from Spain, Portugal, the field crops of Cornwall, Jersey, and the St. Malo district of France. So long as high prices are willingly paid for new potatoes increased efforts will be made to meet the demand. As recent experiments in Egypt show that potatoes can be ripened at almost any period of the year, other countries will doubtless join the competition, and there is a prospect that before long new potatoes may be obtainable almost the year through.

Formerly Cornwall and the Channel Islands were first in placing new potatoes on the market. Now the Scilly Isles take precedence of both, and the particulars I have obtained from these sources, followed by reports from other districts, will, it is hoped, be interesting and of practical value.

The Scilly Isles.—These islands are so favoured, as regards climate, that they can send early potatoes to market considerably in advance of Cornwall or Jersey.

Mr. E. H. Banfield, of Holy Vale, St. Mary's, says that the potato crop is becoming a very small affair, only 30 to 40 acres being grown, but more are planted on the off islands. Potatoes are grown principally for the purpose of cleansing the ground in preparation for flower and bulb culture. The sorts in vogue are chiefly Myatt's Ashleaf and Jersey Royals, and Mr. Banfield was able to place his crops on the market on the following dates:—1894, May 16; 1895, May 28; 1896, April 14; 1897, April 27; 1898, April 6. The dressing used is seaweed and stable manure, supplemented with 4 cwt. of guano per acre. The average yield is from 2¼ to 2½ tons per acre, and the price realised is 3*d.* to 4*d.* per lb. The yield is certainly very light, but taking the lower figures in each case, the amount realised for 2¼ tons at 3*d.* per lb. is 63*l.* per acre, certainly no insignificant sum.

Mr. T. G. Brown, manager to Mr. Dorrien Smith, of Tresco, wrote me that about 80 acres are annually planted with Myatt's Ashleaf. The dates of despatch for four years were:—1895, May 7 to June 6; 1896, April 7 to May 8; 1897, April 27 to May 21; 1898, April 12 to June 1. Forty tons of the earliest arrivals realised an average of 16*l.* per ton. Later on, the prices

fell to from 7*l.* to 10*l.* per ton. One and three-quarter tons were planted per acre, costing 5*l.* per ton; other expenses, not including rent, amounted to 12*l.* per acre. In this case also the crop was very light.

Cornwall.—For the following facts I am indebted to Mr. Barfell, of Ludgaven, Long Rock. The crops are ready for placing on the market between the last week in May and Midsummer. The presence or absence of spring frosts determines which shall be first in the market. Myatt's Ashleaf is almost exclusively grown, the seed being often purchased from Lincolnshire, as affording a good change. The average yield per acre is from 8 to 12 tons, and the prices range from 10*l.* to 12*l.* per ton when the season opens, gradually falling to 6*l.* at the close. The rent paid is generally about 5*l.* per acre. and the total expenses of the crop amount to 50*l.* per acre. This of course is a very heavy sum, but if 10 tons per acre can be grown and sold for 100*l.*, the Cornish farmers, in favourable seasons, should have handsome balances at the close of the year.

Jersey.—The Jersey potato fields are very heavily manured, far more heavily than would appear to be necessary or wise, and the liability to an attack of disease is thereby increased. Artificials to the extent of 1 to 2 tons per acre are used in addition to a very heavy dressing of farmyard manure. Seaweed or "wrack" is also employed, and on light soils this is preferred to farmyard manure, as the salt ensures a greater amount of moisture. The manure, rent, cultivation, cost of seed, lifting and carting to St. Heliers, &c., often carry the total outlay up to 40*l.* per acre. It will be evident therefore that only good crops and good prices can prove remunerative. The seed is carefully separated at the time of lifting, and "boxed" at once. These boxes are very simply made, and are supplied at a moderate price. They are so constructed that when filled they can be placed one upon another without injury to the tubers, and in such a manner as to allow a free current of air to pass through the stacks of boxes. The boxes hold about 14 lb. each (when the tubers are set up for sprouting), so that the seed for planting 5 or 10 acres occupies much space, and the large barns or sheds are generally built with great care to avoid extremes of heat and cold.

In November the boxes are all gone over very carefully, women being employed to place each tuber on its "stem" end. By this means the shoots from the buds or eyes are produced with great regularity, and the tubers can the more easily be planted without injury to the shoots.

Fig. 46 — Harvesting potatoes in Jersey

Fig 47—Weighing potatoes on the quay, Jersey, before shipment

FIG. 48.—Unloading empty barrels and shipping potatoes, Jersey.

In February the boxes are taken to the fields and the tubers placed in the ground without injury to the well-developed shoots. The advantage of this method is obvious, especially where early potatoes are grown. Until serious risk of frost is past the tubers are not planted, but immediately danger is over, every day is of importance because the price of the crop depends entirely on the date when it can be marketed. From potatoes, prepared and planted as described, the crop will be ready for lifting at least ten days earlier than those which do not have this attention.

The crops are through the ground in March, and the earliest sorts ready for lifting (fig. 46) generally by the end of April. From this date till the end of June the quay of St. Heliers (fig. 47) and the roads leading to it from all parts of the island are crowded with carts and wagons laden with potatoes. The growers do not pack the barrels for shipment; they merely place the tubers in baskets and barrels, which are carted to one or other of the merchants in St. Heliers, whose stores and yards present a striking scene of bustle and activity.

So far as I could learn, the farmers have no knowledge of the sum they will receive until they reach the merchant's yard, where they learn the market value for the day, with which they must either be content or take their potatoes home to depreciate in value. It cannot fail to strike a visitor as anomalous that the Jersey farmers should place themselves so entirely in the hands of the merchants. The explanation is that in early spring the farmers buy from them enormous quantities of artificial manures, for which they are not always able to pay ready money, and they are bound to take their produce to the merchant in order to settle the manure account. I learned that the English growers were desirous of shipping direct to English merchants and salesmen, but, for want of co-operation on the part of the native farmers, little could be done in this way.

After delivery to the merchants, the potatoes are packed in barrels, which are then carted to the steamers at the quay, and at the time of my visit about 1,000 tons were being shipped daily (fig. 48). Sometimes, as seen in another photograph I had taken (fig. 49), potatoes are shipped loose in bulk, chiefly for the north of England and the mining districts.

As a result of the copious spring rains in 1898 the Jersey crops were very heavy. In many cases the weight reached from 8 to 10 tons per acre, but at the time of my visit the prices realised were only 70*s.* to 5*l.* per ton, and the profit was not large.

The sorts grown in Jersey have undergone a great change, and unfortunately a change for the worse. In order to secure

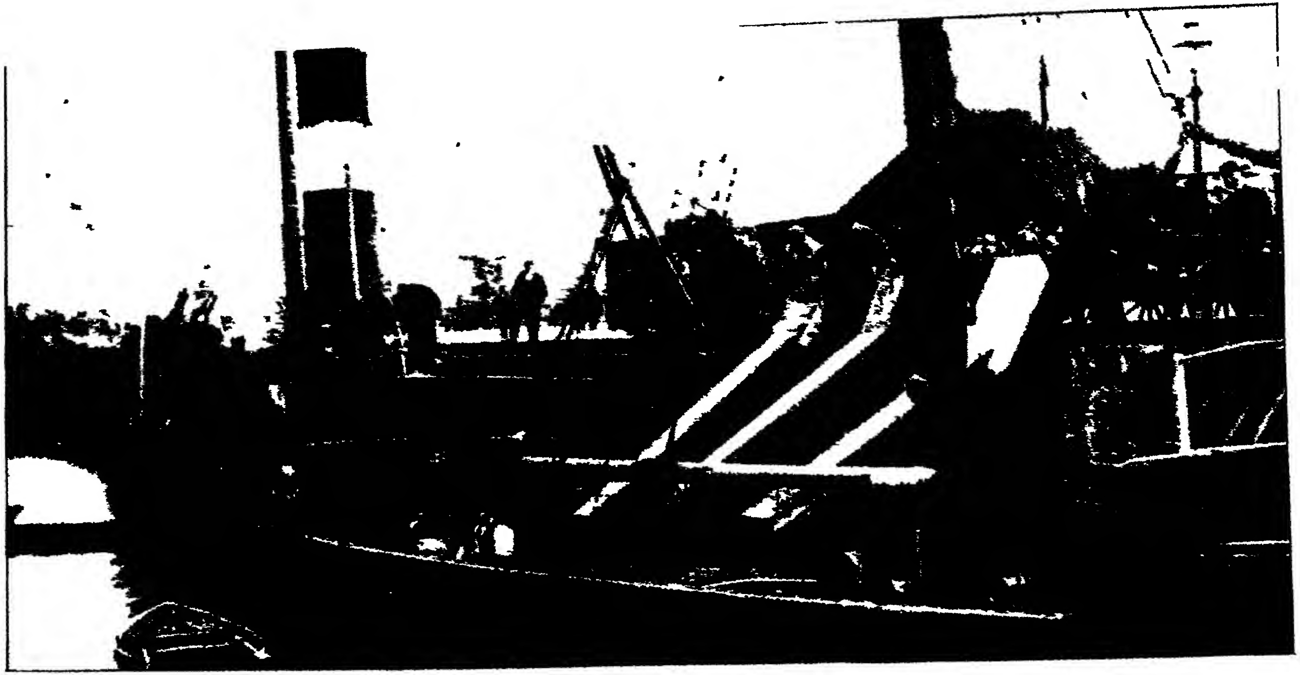

Fig. 49 —Shipping loose potatoes, Jersey.

bulky crops the old Ashleaf is very little grown. Jersey Flukes and Royals have been substituted. The result is that instead of a potato of medium size and unrivalled flavour, a very large tuber is produced, white in flesh and almost tasteless, or actually disagreeable. The merchants say that the demand in England is for these large potatoes and they must meet it, consequently the farmers must grow what the merchants will buy. I was told that most of these large watery potatoes are bought for restaurants, hotels, &c. There is some hope, however, of a reaction in favour of potatoes of better quality. Trials in various parts of the island have conclusively shown that large crops of Ringleader can be grown; and as this is at least a fortnight or three weeks earlier than the Fluke, the higher market prices obtainable will lead farmers to plant Ringleader, especially as the table quality is unsurpassed even by the old Ashleaf. Another kidney potato lately introduced is Ninety-fold. This also has proved to be an exceptionally heavy cropper and very early. In the near future, therefore, Flukes and Royals may give way to potatoes of better quality and flavour.

Farms in Jersey are very small, from 5 to 10 acres being common, and 15 to 20 acres constituting a large holding.

Mr. John A. Perree, Secretary of the Royal Jersey Agricultural and Horticultural Society, has given me the following report regarding manures used on his farm:—

Potato manures used here, analysis:—

8 per cent. ammonia supplied with sulphate of ammonia.

18 per cent. to 22 per cent. soluble phosphates supplied with mineral phosphates.

1 per cent. to 3 per cent. potash supplied with sulphate or muriate of potash.

Of this compound, there is applied at the time of planting and, as a rule, in the row, at least 14 cwt. per acre up to 1 ton per acre. Top dressing, when the crop begins to show above ground, is not done.

Besides the above dressing, a very liberal application of dung may be added, or, as a substitute for dung, bones (vitriolised or dissolved) are applied, after ploughing, at the rate of 12 cwt. to 1 ton per acre. Bones, as referred to, analyse 1 per cent. to 1½ per cent. ammonia and 30 per cent. to 38 per cent. soluble phosphates.

St. Malo.—The growth of early potatoes in St. Malo is increasing very rapidly. Both labour and land are cheap, and the crops can be lifted at about the same time as those in Jersey, so that St. Malo may before long prove a serious rival. Very much the same cultivation is adopted; the seed tubers are boxed and set up on end in November, planted in February, and the lifting commences in April. At the commencement of the 1898

season 20*l.* per ton was realised, but at the time of my visit near the end of June the price had fallen to 3*l.* per ton. This price might still pay the St. Malo grower, but in Jersey, where expenses are so much heavier, it could only result in loss.

The St. Malo growers pack their potatoes in hundredweight hampers, and they obtain from 3 to 10 tons per acre.

Ayrshire.—The lifting of early potatoes on the west coast of Scotland follows immediately on the close of the Jersey and St. Malo season. Girvan forms the centre of the earliest district, and a visit to this neighbourhood at the end of June or early in July would well repay any English grower of early potatoes. Probably, as regards potatoes, in no part of England could a scene of such activity (fig. 50) be witnessed at any time of the year. As in Jersey, so here, the market value of the crop depends entirely upon the date at which it can be lifted, and consequently no delay is permitted when once the potatoes are ripe. Manifestly local labour would be insufficient when hundreds of acres require lifting simultaneously, and the demand for new potatoes is so great that there is no danger of the markets being flooded at the commencement of the season.

Instead of the small farms of from 10 to 15 acres, usual in Jersey, holdings of 150 to 400 acres are common in the district now under consideration, and every acre that can be made to produce early potatoes profitably is devoted to this crop. As the farmers of Ayrshire are second to none in intelligence and perseverance, combined with the innate shrewdness characteristic of the country, the results they achieve are not likely to be surpassed elsewhere.

Puritan is almost invariably planted for the earliest crop, and though the quality is not first-rate, the form is good, and it has not yet been easy to find a better variety for the purpose, especially as in Ayrshire there is a decided preference for a round rather than a kidney potato.

To follow the Puritan, Dons used to be grown, but these have now been almost entirely superseded by Harbinger, Early Regent, Nonsuch, and Windsor Castle. Of these sorts enormous crops are lifted, especially of Nonsuch, which is rapidly becoming a marked favourite. When first tried, through an unfavourable season, Nonsuch gave poor results, and the farmer who had it sold his stock. Mrs. Marshall, who with her son farms at Shanter in the parish of Turnberry, celebrated in Burns's "Tam o' Shanter," bought the stock and grew it under the name of Turnberry Maidens, and her success was so great that every farmer in the district now grows the Nonsuch. This potato has undoubtedly been the means of

adding thousands of pounds to the returns of the Ayrshire farmers. When I visited Shanter Mrs. Marshall spoke of it in very enthusiastic terms.

Abundance, cultivated as a maincrop potato in the South, is grown in Ayrshire to follow Nonsuch and with satisfactory results, as the potatoes, even before they ripen, are of excellent quality, and the yield is very heavy.

Mr. Marshall told me that their farm of Shanter was 200 acres in extent, of which 65 acres are in potatoes. One field crop was sold for 35*l.* per acre; a later crop alongside, not quite so heavy, for 27*l.* The expenses of crop, including rent, rates, taxes, &c., range from 14*l.* to 22*l.* per acre. Whether manure at 5*s.* to 6*s.* per ton has to be bought or not accounts for the variation. Sometimes 20 tons of seaweed per acre is used instead of farm-yard manure.

On a large farm of about 800 acres which I visited near Girvan, 140 of the 450 arable acres are annually planted with potatoes, sometimes in rotation, though as a rule the most suitable land is planted with potatoes year after year. I saw capital crops in fields that had grown potatoes without a break for 20, 30, and in one instance for 40 years.

At the time of my visit, potatoes were selling for about 26*l.* per acre, but when the season opened, about June 15, the crop was worth 12*l.* per ton. The merchants in Glasgow generally buy by public auction and engage one of the numerous gangs to lift the crop (figs. 50 and 51).

I visited another farm, of 320 acres. 209 acres were planted with potatoes. The rent was 1,025*l.*

Further on I found half the holding under potatoes, one field having been in potatoes for 33 out of 35 years, without any diminution in the yield.

One of the most successful farmers I visited was Mr. Scoular, whose land adjoins the Burns Memorial, some three miles outside the town of Ayr. From him I learned that formerly rape was largely sown after potatoes, but finger-and-toe had so ruined the rape crops that rye grass had to be substituted. It is hoped, however, that after 5 or 6 years' cropping with rye grass, rape may again be grown, especially if 10 cwt. of lime ground at kilns is applied per acre.

Mr. Scoular's crops were later than those at Girvan, but on July 15 I learned that a crop of fully 9 tons per acre of Harbinger had been marketed, and Nonsuch was then being lifted at about 11 tons per acre. Mr. Scoular markets his own potatoes, and the price having fallen to 94*s.* per ton, he paid off the gang at work until markets were firmer. For Puritans

FIG 50 —Harvesting potatoes in Ayrshire

he realised 6*l.* 12*s.* 6*d.* per ton at first, less expenses, making 32*l.* to 36*l.* per acre. In this district it is expected that digging will commence by the longest day, but in 1898 the crop was two weeks later than usual owing to the cold wet spring. Mr. Scoular devotes one large field to potatoes, and it has been under potatoes successively for 11 years.

Particulars of climate, soil, cultivation, &c., I am glad to be able to give in Mr. Scoular's own words :—

Potato District.—The land devoted to the raising of the earliest varieties of potatoes is confined to those farms bordering on or very near the sea—certainly not more than a mile from the shore may be put as the limit.

Climate.—The climate, as a rule, is mild during winter, and the spring free from injurious frosts. This undoubtedly is due to the influence of the Gulf Stream, a branch of which breaks upon the Ayrshire coast.

Quality of the Soil.—The land is light loam, and in some parts sandy, and of a fair depth. On many fields potatoes have been grown without a break for years, some we know of from 25 to 30 years, and the productiveness of the soil is not impaired, but to meet this constant potato-cropping heavy manuring is necessary.

Cultivation.—In the autumn and early winter the land is ploughed with an Oliver plough, or a plough of a similar pattern, which gives a deep furrow and breaks the soil well. Well-rotted manure is spread on the land before ploughing, 25 to 30 tons per acre being the usual quantity. Sea-wrack is plentiful, and, where the shore is of easy access, largely taken advantage of. This, where used, takes the place of farmyard manure, and, being rich in potash, a surface dressing of any of the forms of potash is not necessary. The crops grown are quite as satisfactory as from farmyard manure, but rather more artificial is used, about 2 cwt. per acre. If the land is fairly clean very little work is necessary upon it in spring; at the most a heavy grubber or cultivator is passed over it, it is then harrowed to get rid of any weeds, and levelled up ready for drawing into drills. Very soon after planting the drills are harrowed down, to allow the influences of sun and moisture to work upon the seed. When the leaf is showing well above the top of the drill, a thorough grubbing is done by a two-horse grubber; taking out weeds between the plants is then proceeded with. This is easily done by women by hand. Constant stirring of soil between the drills is carried on by drill-harrows and grubbers all through the period of growth.

Surface Dressing.—3 to 4 cwt. of crude potash, kainit, &c., is put on the land some time before the planting season, sown on the surface as left by the plough.

Undoubtedly the district is singularly favoured by nature, the influence of the Gulf Stream, as Mr. Scoular observes, conferring upon it a mild and equable temperature. Drought is seldom or never experienced during the growth of the crop, and there is little fear of injury from excessive rainfall while the crop is maturing.

In Ayrshire the seed potatoes are boxed as soon as lifted and placed in open sheds. Later on the boxes are moved into warmer barns and lofts, but without any artificial heat. Unlike the Jersey practice, the tubers are not set up on

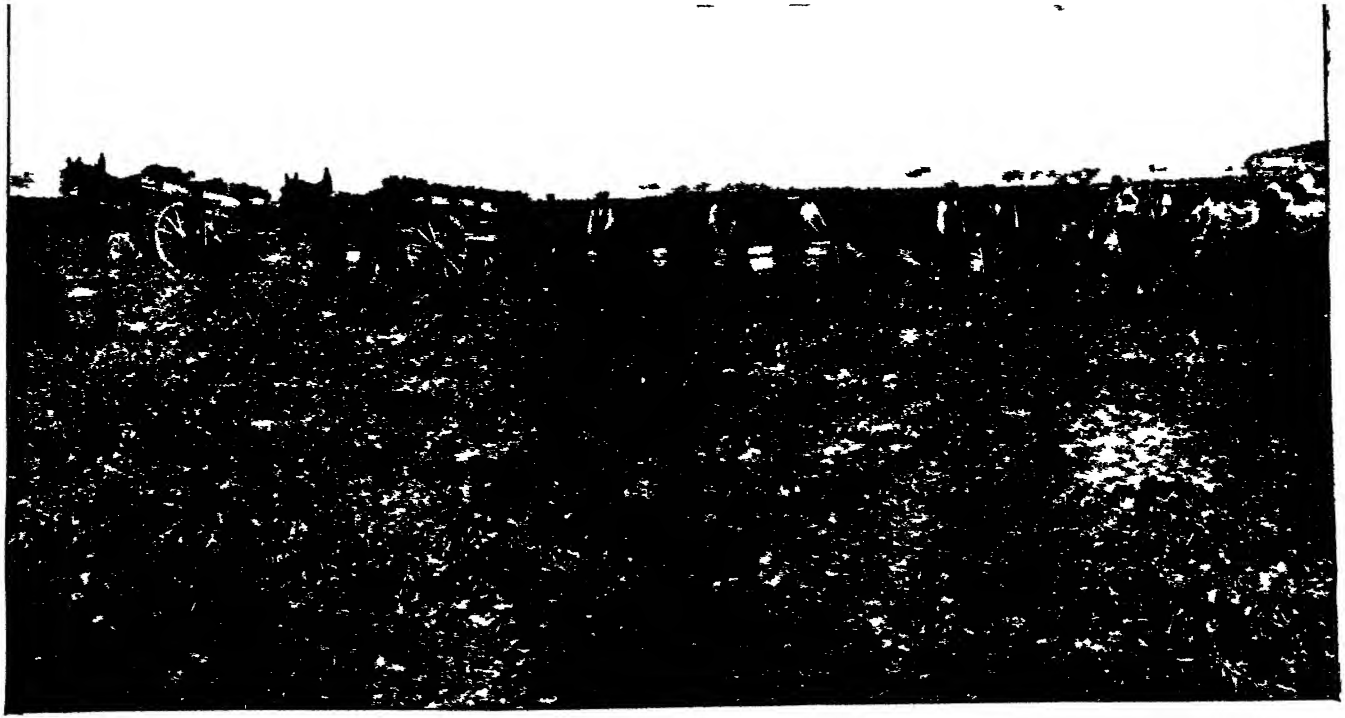

FIG 51 —Lifting and packing potatoes in Ayrshire.

end, but left untouched in the boxes until planted in the spring.

Mr. Scoular continues as follows:—

Seed.—When the crop is lifted in June and July seed is selected and placed in boxes, not more than two deep. Some years ago it was customary to keep very small seconds for seed, but now fairly large seed is used, of course planted whole. Potatoes are planted out of the boxes by women—light square scoops being used to fill and plant out of by the hand—10 to 12 inches apart.

Planting.—When a dry mild spell of weather occurs, planting is sometimes begun in January and often in February, but the greatest breadth is done early in March. The principal reason for the very early start is simply to get forward with the work, many farms having 80 to 100 acres. It is of very great importance not to plant till the land is in a nice free state.

Drills.—The land is drawn off in drills by a combined driller and artificial-manure sower, which makes two drills at a time, some machines three drills—drills 25 inches wide. Manure 10 to 12 cwt. per acre, usually 10 cwt.

Artificial Manure.—The standard for artificial manure for early potatoes is, 10 per cent. of ammonia, 6 per cent. sulphate of potash, 16 per cent. soluble phosphates.

Top Dressing.—The custom is not to apply any artificial manure after planting; but top dressing is sometimes done with, say, 1 cwt. nitrate of soda or sulphate of ammonia per acre when plants are just weeded, and in many cases proves beneficial.

Raising.—Taking one year with another, raising of the crop begins about June 20, and by the first week in July it is general.

As already mentioned, local labour would prove entirely inadequate; consequently gangs from 25 to 50 in number, of women, girls, and men, come over from Ireland and either join with local labourers, or each gang keeps together and moves from farm to farm, and parish to parish, as the various crops are ready to lift.

To illustrate the plan of operation I had photographs taken of some of the gangs at work; each gang of course is under the direction of a foreman. Six or seven couples will generally lift an acre per day. The average sum paid to each person is 2*s.* 3*d.* per day. The members of a gang work facing one another (fig. 50); one person will dig two rows, the mate sorting the produce into two baskets, one for ware, the other for seed. The two workers occasionally relieve one another by changing places. Figs. 52 and 53 illustrate riddling and packing.

Mr. Scoular concludes by stating:—

Disease is hardly known amongst the very early lots. Just at the close of the season it may break out, but never to a serious extent. Amongst the second early lots disease is often disastrous.

Produce.—The produce per acre of the first lifted lots will run from 3 to 6 tons; later liftings from such as Nonsuch will go from 8 to 14 tons per acre.

Quality.—In moist or wet seasons complaints are made as to the quality of our early potatoes. Unfortunately there is too good ground for these complaints—the forcing is to blame—too much artificial manure is used to get quality with early maturity: but if the crop is not early it will not command a paying figure.

Prices.—Nearly all the farmers sell their crops to potato dealers, very few market them. Very early lots bring 35*l.* to 40*l.* per acre, but the average is 26*l* to 32*l.* per acre.

Varieties.—The most satisfactory varieties grown at present are: Early Puritan, Nonsuch, Windsor Castle, and Seedling. The Puritan is the earliest of all, followed often by Goodrich, both of middling quality.

After Crop.—Immediately after potatoes are raised the land is sown with rape, Italian rye grass, or barley—rape by preference if there is no chance of

FIG. 32.—Riddling potatoes, Ayrshire.

finger-and-toe—and excellent crops are secured which are eaten off by sheep, an easy and profitable method of bringing up the fertility of the soil.

To sum up, the successful early-potato grower ploughs deep, and keeps working amongst the crop all the time: plants *not before* his soil is in fine condition: manures heavily and uses pure seed.

The barley is sown broadcast *before* the potatoes are lifted, and the ground is harrowed level afterwards, the haulm being left on the ground. The barley often grows 4 feet high and is sometimes cut green for "soiling," but more frequently it is sheaved early in October for hay. During my visit the barley was already 4 to 6 inches high where the earlier crops of potatoes had been lifted.

Rye grass, after potatoes, is fed off and will often carry 10

sheep to the acre for two months. If intended for seed, it is fed until March and then cut for seed in July.

I am indebted to Mr. Scoular for a subsequent note, accompanied by the following report "of a remarkable crop" grown by Mr. Stevenson, of Woodland, Girvan, the variety planted being Nonsuch:—

I had only a small lot of that variety, viz. 3 acres 1 rood 28 poles, and the yield therefrom was 49 tons 11 cwt. of saleable potatoes dressed over 1¼-inch riddle. They were planted on March 9, and were dug on July 13 and 14. Seaweed was applied on the land in October last year, about 30

FIG. 53—Packing potatoes, Ayrshire.

loads to the acre, and 12 cwt. of artificial manure applied in the drills at planting The artificial manure was of my own mixture, and contained 10 per cent. of ammonia, 19 per cent. of phosphates, and 7·5 per cent. of potash. The quality of the potatoes was very good.

(Signed) JOHN STEVENSON.

Mr. Reid of Mid Sanquhar, one of the chief authorities on potatoes in Ayrshire, grows from 35 to 60 acres of potatoes annually on a farm of 130 acres. The situation being exposed is liable to frosts in spring, so that he cannot secure the earliest markets. Mr. Reid makes very careful experiments with all the new potatoes offered by seedsmen and others, and his farm is visited by the chief Ayrshire growers, who purchase

seed to renew their stocks from time to time. He wrote me as follows in 1896 :—

For a number of years I have grown about 50 acres of potatoes, principally for the early market. I annually purchase and test all the varieties I hear of likely to suit this purpose. On account of so many soft varieties being grown in this country our potatoes have got a bad name, and it has been my constant aim to supply the consumer with varieties the qualities of which can be depended on. At present my favourite is Windsor Castle. No matter what weather we have during growth, this potato can be depended on to give a quality crop, and should it be left till ripe scarcely a diseased tuber will be found. In our highly cultivated land it has the fault of growing too big. This I have been trying to remedy by curtailing that bane to farmers, artificial manure. Using just one half of artificials, 5 cwt. per acre where others use 10 cwt., I had last year on 18 acres an average of $12\frac{1}{4}$ tons per acre of double-dressed potatoes. The seed dressed over $1\frac{1}{4}$-inch riddle would be about 20 tons more, and about 3 tons were still too big. The small and refuse I kept no account of; they were used for cattle feeding. Nonsuch I consider to be the best quality of potato for this district yet put on the market. Abundance is largely grown in the country, and gives the greatest satisfaction, as it is said to take the place of the old Red Bog, a variety now almost extinct.

The land is mostly dunged on the flat, and as a rule follows lea oats. Forty to fifty loads of dung, according to circumstances, is the quantity usually applied per acre. The land is immediately ploughed with the chill plough as shallow as possible, and just sufficient to cover the manure. In this state it lies till spring. It is then harrowed and ploughed as deep as the subsoil will permit, and is allowed to mellow until planting time. About the beginning of March may be considered our planting time, according to weather. The land is cross harrowed, and the double drill plough and manure distributor (combined) set in order. This machine is of local manufacture, and draws two drills and sows the manure at the same time. The drills are left without mark of a hoof, and this is a particular advantage where the system of boxing seed is carried out—a system generally practised whenever early potatoes are grown in this country—as it enables the sets to be more evenly distributed in the drill. After planting, the sets are covered with the double mould plough. The after management is ruled by circumstances, and as it is only of local concern nothing, I think, need be said further.

Dumfriesshire.—One of the most important growers of potatoes near Dumfries is Mr. Wallace, of Terreglestown. His farm is too far inland to receive the full benefit of the Gulf Stream, and the potato crop is comparatively late, but digging was in full operation by July 12. One third of the farm of 330 acres is in potatoes, and the rotation Mr. Wallace generally follows is potatoes, Italian rye grass, oats or wheat, potatoes, &c. Supreme and Seedling are largely grown, both being ready to lift in July.

Writing in 1896 Mr. Wallace said he agreed with me that the disease can be best combated by the introduction of new and vigorous sorts. Amongst the early sorts he singles out

Early Regent and says that under fairly liberal treatment and a comparatively humid climate it is capable of giving enormous crops, and that for a long series of years he was very successful with it, the yield rarely falling below 11 or 12 tons per acre of marketable tubers *in July*. He also strongly recommends Windsor Castle, the sort he is now growing most largely. Mr. Wallace says these, being heavy croppers, coming early to size, and having few seconds, look well in a truck and are of good quality. He raised 7 tons per acre on *June 29 and 30* last year.

Bedfordshire.—In districts where potatoes form part of the ordinary rotation of farm crops the expensive treatment adopted in Jersey and other favoured localities would be a foolish waste of money. Among these districts Bedfordshire first claims attention. In that county the soil is generally light, and very large crops of second early varieties are annually grown with excellent results, the crops being ready for lifting from the middle of July to the end of August.

The smaller tubers are generally riddled or picked out of the crop for seed and then clamped in the manner of the ware of later districts, until the time arrives for planting in the spring. Boxes are not used, and as a rule no attempt is made to sprout the sets before planting. Indeed such a plan would be impossible where potatoes may be got in with some of the newer potato-planting machines.

A well-known grower in Bedfordshire has given me the following account of his potato culture, and on the whole it would appear to be not the least profitable crop on his farm :—

It is pretty generally known that this part of Bedfordshire is largely occupied by market gardeners, and that potatoes are a staple product of the district. I usually grow from 80 to 100 acres of potatoes, and adopt a six-course rotation as follows :—

1st year. Wheat.
2nd „ Potatoes, with 25 tons manure besides artificials.
3rd „ Carrots, parsnips, sprouts, beet, and fancy peas for seed purposes.
4th „ Barley.
5th „ Onions or early potatoes, with 40 to 50 tons manure and artificials.
6th „ Turnip, mangel, or other farm seeds.

This is exhaustive cropping, but the heavy manuring every third year keeps the land in good heart.

Every practical agriculturist knows that it is very difficult to estimate the cost of any one crop in a particular rotation, but on a careful analysis of recorded facts I consider the following table an approximation of what it costs me to grow an acre of potatoes :—

	£	s.	d.
Rent and rates	3	0	0
25 tons London manure	6	5	0
Carting and spreading ditto	1	5	0
4 cwt. basic slag, 4 cwt. kainit, 2 cwt. nitrate of soda (and sowing the same)	2	5	0
Twice ploughing	1	0	0
Seed and planting	1	10	0
Harrowing and horse-hoeing	0	6	6
Twice hand-hoeing	0	7	0
Moulding up	0	2	6
Digging, sorting, and carting	2	0	0
	£18	1	0

The residual value of the manure would be quite 3*l*., leaving the net cost at about 15*l*. per acre. Potatoes must have a good tilth, and I always plough at least 10 inches deep.

During the past six years, for which I have kept careful accounts, my average yield per acre has been 7¼ tons, and the average price per acre 19*l*., leaving a net profit of 4*l*. per acre. Owing to the spring and summer droughts of the past four seasons the yield and the quality have both been much below the average, and the prices realised have been wretchedly low. In 1890 and 1891 I averaged 10 and 11 tons per acre, and realised 26*l*. and 27*l*., and with ordinary seasons hope to do the same again.

Another large grower in Bedfordshire supplied me with the following particulars in 1896. His land is situated near to a station, and the following account shows an average loss per acre of 2*l*. 14*s*. 1*d*. :—

	£	s.	d.
Rent and taxes, 24*s*.; once ploughing in September, 10*s*.	1	14	0
Harrowing the tilth in March	0	1	0
25 tons of shortened manure, at 7*s*. per ton	8	15	0
Spreading manure, 2*s*.; ploughing in seed potatoes, 10*s*.	0	12	0
Seed and planting	1	10	0
Scuffling land with six-horse scuffle across furrows	0	5	0
Once drag-harrowing with four horses	0	3	0
Twice harrowing at intervals (two-horse harrows)	0	2	0
Horse-hoeing (3 times) with grubbers fixed	0	4	6
Hand-hoeing twice, at 4*s*. per acre	0	8	0
Earthing up with moulding plough	0	2	6
Digging and sorting, at per acre	1	5	0
Drawing to railway, at 2*s*. 6*d*. per ton	0	17	6
Sowed broadcast before horse-hoeing 80 bushels of soot, at 6*d*.	2	0	0
Man sowing same, 1*s*. 6*d*. per acre	0	1	6
	£18	1	0

CROP.	£	s.	d.	£	s.	d.	£	s.	d.
5½ tons best potatoes at present price, 60*s*. per ton				16	10	0			
1 ton seed potatoes, at 50*s*.				2	10	0			
				£19	0	0			
Salesman's commission, 6½ tons, at 5*s*. per ton	1	12	6						
Railway freight, 6½ tons, at 6*s*. 3*d*. per ton	2	0	7						
				3	13	1			
							15	6	11
Total loss on entire crop per acre							£2	14	1

It must be remembered, however, that this being an early district it suffered from the excessive drought. Consequently the total yield of $6\frac{1}{2}$ tons per acre is low, and with a more favourable season and a yield of 9 or 10 tons per acre, a handsome profit would have been realised.

Writing again in 1898 he was able to report much better results, as follows:—

Last year was a much more profitable year than 1896 as regards the potato crop, and shows a good profit under similar cultivation. I had a crop of Triumph last year which averaged 90*s.* per ton on the market, and the seed was worth 80*s.* The crop then showed a good profit. I had also another small piece of potatoes which did even better. The scuffle and drag harrows were not used, as the land was fairly clean. Herewith I hand you balance-sheet of the crop:—

Statistics of one acre of potatoes in 1897.

	£ s. d.	£ s. d.
$5\frac{1}{4}$ tons best ware at 90*s.*	24 15 0	
1 ton seed	4 0 0	
		28 15 0

Expenditure.

	£ s. d.	£ s. d.
Rent and taxes	1 4 0	
Once ploughing	0 10 0	
Harrowing tilth in March	0 1 0	
25 tons manure, at 7*s.*	8 15 0	
Spreading manure	0 2 0	
Ploughing in seed	0 10 0	
Seed and planting	1 10 0	
Twice harrowing with horse harrows	0 2 0	
Horse-hoeing (3 times)	0 4 6	
Hand-hoeing twice, at 4*s.*	0 8 0	
Earthing up with moulding plough	0 2 6	
Digging and sorting, per acre	1 5 0	
Drawing to station, at 2*s.* 6*d.* per ton	0 17 6	
80 bushels soot sown broadcast, at 6*d.*	2 0 0	
Sowing same	0 2 0	
	17 13 6	
Salesman's commission on $6\frac{1}{4}$ tons, at 5*s.*	1 12 6	
Railway freight, $6\frac{1}{2}$ tons, at 6*s.* 3*d.*	2 0 7	
		21 6 7
Net profit per acre		£7 8 5

Cambridgeshire.—Mr. H. Fortescue Fryer, of The Priory, Chatteris, sent me an interesting report in 1896. After premising that his growth of potatoes for the last five or six years had been chiefly confined to a few of the principal market sorts, such as Magnum Bonum, Abundance, Myatt's Ashleaf, Reading Giant, and recently Maincrop, he proceeded:—

Of these, for general crop, and taking one year with another for all soils, the Magnum holds its own. It is nearly free from disease even in wet

seasons, and is a uniformly good cropper. In a good year its cooking qualities have on my land been all that could be desired.

Abundance, when the season suits, is a heavy cropper, whiter and more floury than the Magnum, but it more easily succumbs to the disease, and has recently tended to lose colour in cooking when kept till the spring. Indeed most potatoes, even including the Magnum, have suffered from this fault. This, however, may be attributed to a certain extent to the fact that land may become "potato sick," as is the case with clover, where land becomes "clover sick." My land has been cropped with potatoes—frequently in alternate years—but more often now every three years for nearly half a century. This will not, however, account entirely for the loss of cooking qualities, as my neighbours who have not grown potatoes to so great an extent also suffer from the same thing.

I am inclined to think that every variety of potato after an uncertain time declines in vigour, until its constitution as it were becomes broken and it ceases to be worth growing.

We are thus very dependent on the introduction of new and vigorous

Fig. 54.—Harvesting potatoes in Cambridgeshire.

varieties: the one difficulty for farmers being, however, the question of price, as new varieties must from the nature of things be sold for some years at a cost which precludes their buying sufficient seed for a field crop.

My method of culture is as follows: I plough the land in the autumn with 4 horses some 10 inches deep, and sometimes run a scarifier down the furrow after the plough. The land is then left rough for the frost to break it down. In an ordinary winter this happens to a sufficient extent, and once harrowing in the spring brings the land to a fine tilth. I then cart on some 10 loads of farmyard manure, and plough in the potatoes 27 inches apart from row to row and about 10 inches from set to set. When farmyard manure is not available, I put on 4 to 6 cwt. of superphosphate. Many growers use from 10 cwt. to 1 ton, but I am doubtful whether if the land is in good heart the extra quantity produces an equivalent advantage, and I am at present uncertain of the effect on the next crop of a very large application of mineral phosphate.

The potato crop is scarified between rows twice, and hoed between the sets, and is, when high enough, moulded up.

In recent years one great fault in all late potatoes has been the second growth. A few tubers form and come to maturity; a very slight check in the growth from drought will cause these tubers to grow again, sometimes by elongation and sometimes by throwing out fibres which bear other tubers. This is entirely destructive of the cooking qualities of the potato.

With regard to profit, I believe the potatoes for the maincrop have for the last few years been grown at a loss.

Many more have been grown than can be consumed, except when stock are called in to help the consumption, and I look to the growing of second earlies, *i.e.* potatoes which will ripen at the beginning of August, as the only profitable course to pursue. But the advantage from this will probably be ephemeral, as farmers will soon see where profit can be obtained, with the result that the early markets will be as overstocked as the late ones are now.

As long as wheat is low in price, land which would in the ordinary course be devoted to this crop will be planted with potatoes in the hope of a possible profit.

In September 1898 Mr. Fryer stated that the only addition he wished to make was that the crop was more remunerative than in 1896, and he favoured me with a photograph taken by himself, representing the potato harvest in the Cambridgeshire Fens. This is reproduced in fig. 54.

Lincolnshire.—A very large grower gave me in 1896 a table of the average cost of his potato crop per acre, but he makes no comment on the profit or loss. It will, however, be obvious that a large crop per acre is a necessity if the balance is to be on the right side.

Cost of a crop of potatoes per acre in Lincolnshire.

	£	s.	d.
Rent and rates	3	0	0
Four-horse ploughing	0	16	4
Working	0	10	0
Ridges (marking out)	0	3	0
Manure (7 cwt.)	1	7	0
Sowing ditto	0	1	0
Planting	0	2	6
Seed	1	12	0
Ploughing in	0	3	0
Rolling	0	1	6
Horse-hoeing (3 times)	0	4	6
Once hand-hoeing	0	2	6
Twice ridging up	0	8	0
Weeding	0	1	0
Raising	1	5	0
Putting up for market, caring for seed, &c.	0	15	0
Delivering to station, salesman's charges, and railway carriage	6	0	0
	£16	12	4

FIG. 55.—Potato harvest at Mr James Hope's farm, East Barns, Dunbar

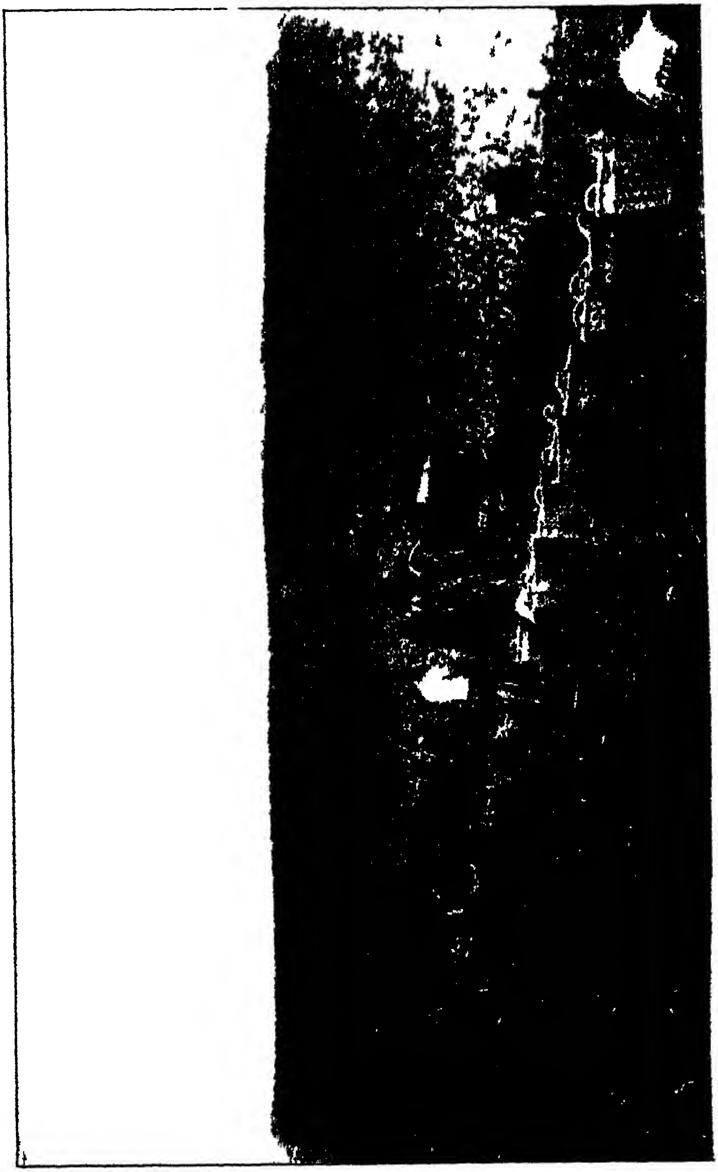

Fig. 50.—Loading potatoes at East Barns, Dunbar.

Fig. 57. Carting potatoes to Clamp at East Barns, Dunbar

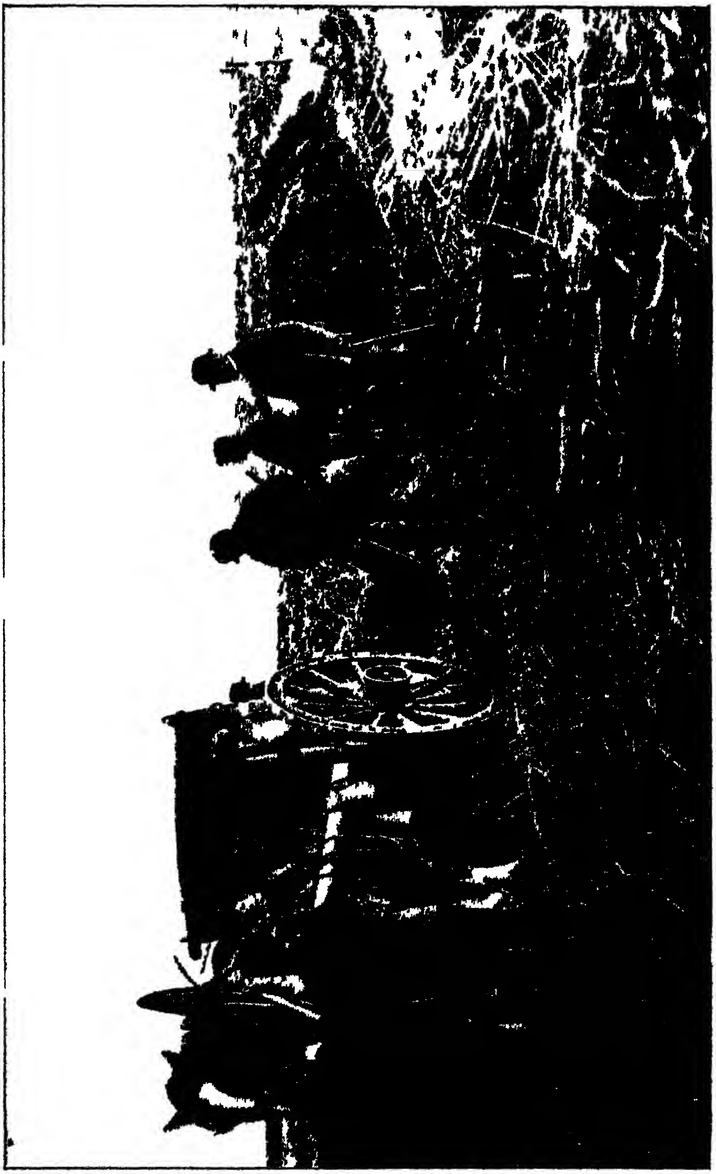

Fig. 59.—Clamping Potatoes at East Barns, Dunbar

In reply to an inquiry for later details I was informed that all particulars are correct up to delivery at railway station. Then came the heavy railway rates and salesman's commission which swallow up the profits. An average output of 10 tons per acre entails a total of 7*l.* 11*s.* 8*d.* per acre under the heading of railway and salesman's charges. It will thus be seen, adds my correspondent, that nothing but heavy crops can make potato growing a profitable source of income to the British farmer.

Haddingtonshire.—Mr. James Hope, of East Barns, Dunbar, has given me a highly interesting account of potato cultivation in East Lothian. The latitude of this district is almost the same as that of Ayrshire, but the climatic conditions of the east and west coasts differ so widely that in the former the cultivation of early varieties cannot be attempted. For profitable culture late sorts only can be grown, and in 1898 Mr. Hope's crop was not lifted until November. Writing on the 5th of that month he mentions that although he has one-third of his farm in potatoes, the usual proportion in East and Mid Lothian is one-sixth, there being one-sixth each in potatoes, wheat, turnips, barley, grass, and oats respectively. Mr. Hope has also furnished me with several photographs showing the method of harvesting potatoes on his farms, and these have been reproduced in figs. 55 to 58. His cultural operations are thus described:—

The farms of East Barns, Barneyhill, and Oxwellmains contain 1,050 acres of arable land, besides about 300 acres of grass land.

The land is farmed on a six course rotation, one-sixth grass, one-sixth potatoes, one-sixth turnips, one-sixth barley, one-sixth potatoes, one-sixth wheat, sown down with grass seeds which is cut for hay sometimes twice. From this it will be seen that one-third of the farm is in potatoes, one-third in grain crop. one-sixth in turnips, and one-sixth in grass.

The potato land or break is manured in autumn with about 20 tons per acre of home-made manure or spent hops, which is brought to the farm from Edinburgh at a cost of 4*s.* 6*d.* per ton with carriage, and of which I get about 2,000 tons in the year, and besides, I generally get seaweed to go over about 40 acres at 35 tons per acre. As the land is manured I plough it in eleven inches deep, and in spring, before starting to plant, the land requires very little work, perhaps only a turn of a grubber or a harrow and roll to put down any clod. I begin to plant early in March, as soon as the spring corn is sown, and I plant in drills twenty-six inches wide and fourteen inches between the plants. I always plant small tubers, seed size. They are planted with double ploughs, draw drills one way and cover the other way, never more than twenty-two drills or so being open at a time, so as not to let the land dry. It takes about 1 ton to seed an acre, and I sow 5 cwt. of light manures in the drill along with 1½ cwt. of nitrate of soda and all covered up with the seed. Before the potatoes come up, I roll and harrow the drills down to kill any annual weeds, and when the potatoes are well up I grub between the drills and go over them with the hoes, and later on, I grub again before setting them up, nothing

more being done until they are lifted. You will see from this that my land requires no cleaning, not a single weed being in the land.

I have this year 325 acres, and at present I am lifting in two places of the farms, two ploughs at each place—Howard's and Ransome's ploughs lifting about 14 acres per day, with about 100 hands, besides 16 pair of horses, and about forty men, some with the horses and others at the potato pits putting on straw and soil. The weather has not been very good, so that I have still 140 acres to lift. I never begin to sell until they are all lifted and properly covered up. I send them all to London, shipped from Dunbar, which is three miles by road, and to drive 3,000 tons of potatoes from December to May is not a light job along with the dressing, having to be all hand-picked, by women generally, picking 1½ tons per day each. I have a good crop this year, perhaps 10 tons per acre, and they are all the Maincrop kidney.

Writing again at the end of November, Mr. Hope further mentioned that on his home farm he began lifting potatoes on October 7 and finished on November 22, having occupied 33 days in lifting 210 acres; during this time they lost six days from wet weather, but averaged 6¼ acres per day for two ploughs. On Mr. Hope's other farm he started on October 20, and in 20 working days lifted 120 acres, two ploughs being at work also in this case.

From the numerous facts I have submitted each reader will draw his own conclusions, and it is quite possible that those conclusions may differ widely. Every farmer has to consider his special circumstances, and, in dealing with the potato, variations in methods of culture are inevitable. Obviously no uniform routine can be suitable for differing climatic conditions. The capabilities of the soil and the demands of the market must be determining factors. The selection, moreover, of the variety which will give the most profitable return is a subject for individual experiment.

ARTHUR W. SUTTON.

Bucklebury Place, Berks.

QUARTER-EVIL.

Cause of the Disease.

Quarter-evil—known also by such names as Black-leg, Black-quarter, Strike, Puck, &c.—belongs to the class of germ diseases, but it is only within the last twenty years that this fact has been conclusively established. The evidence in support of this view of the causation of the disease is at the present time perfectly unassailable, although, as will presently be explained, everything is not yet quite clear in connection with this part of the subject. The proof that quarter-evil is caused by a germ rests upon (1) the observation that in every case of the disease it is possible, by microscopic examination, to detect a particular species of bacillus in countless numbers in the inflammatory swelling which is characteristic of an attack, and (2) upon the fact that with any sort of material containing this particular bacillus one can at will experimentally induce an attack of the disease.

With reference to the first of these items of proof, it may be remarked that this particular bacillus is not only constantly present in cases of quarter-evil, but also constantly absent from the healthy tissues of animals, and from the diseased tissues in other affections than quarter-evil. It is thus as constantly associated with quarter-evil as the scab parasite is with scab in sheep. And in explanation of the full force of the second item of proof above stated, it may be explained that the bacillus in question can be grown or cultivated artificially in or on various simple liquid or solid substances, and that, although these substances are themselves perfectly harmless, even when injected in considerable quantities into young cattle, they can with deadly certainty be used to infect such animals with quarter evil when they contain a crop of this particular bacillus. Furthermore, nothing that does not contain this bacillus or its spores can be successfully employed to infect an animal with quarter-evil.

By injecting into the tissues such things as putrid blood or chemical irritants one can induce various forms of inflammatory swellings, but these have always characters which distinguish them from the swelling of quarter-evil. It may therefore be accepted as a thing not open to any doubt that every case of quarter-evil is caused by the multiplication of a living microscopic germ—the quarter-evil bacillus—in the diseased parts.

THE BACILLUS OF QUARTER-EVIL.

Under this head it is not proposed to discuss all the characters of the quarter-evil germ which are known to bacteriologists, but only to refer to those points which are of special importance.

The quarter-evil bacillus is a rod-shaped structure of such small size that a magnification of about 800 times is necessary to enable one to criticise its form. It is rather smaller than the bacillus which is the cause of anthrax, but considerably larger than the bacillus of tuberculosis. Unlike these two last-mentioned germs, it possesses the power of independent motion, and when viewed under the microscope the rods may be seen to move about with considerable activity in the liquid in which they are suspended. The rod-shaped bacilli have the power of forming in their interior small oval spores, which may be said to play the part of seeds to this very simple vegetable. Just as the seeds of plants can generally retain their vitality in circumstances fatal to the plant itself, so these spores may remain uninjured when exposed to the action of high temperatures or chemical disinfectants which are promptly fatal to the bacilli themselves.

In an animal dead of quarter-evil the only place in which the bacilli are constantly found is the inflammatory swelling or tumour. Here they are always present in enormous numbers, both in the solid tissues of the part and in the blood-stained juice which exudes from it when it is cut open. It is of importance to note that at the time of death the tumour always contains bacilli that have already formed spores, and anything which has been soiled with matter from the tumour can only with difficulty be thoroughly disinfected. The blood in other parts of the body seldom contains the bacilli in large numbers, and not infrequently it appears to be quite free from them. The same is true of the various internal organs, and the flesh of the body elsewhere than in the tumour, but it is said that the bacilli are sometimes present in the bowel and in the dung which the animal passes.

The germs which are the cause of disease in man and animals may be divided into two great classes according as they are or are not able to multiply and maintain their existence indefinitely outside the body—in soil or water, decaying animal or vegetable matter, for example. The tubercle bacillus exemplifies the second of these classes; for there are good reasons for believing that in natural circumstances it never multiplies except in the living bodies of tuberculous animals.

Diseases caused by germs with this habit of life are necessarily always purely contagious or infectious, and never arise independently of any connection with a previous case of the disease.

An example of the first class of disease germs—those that are able to multiply indefinitely in the outer world—is furnished by the bacillus of lock-jaw or tetanus. This organism may be described as a normal vegetable of the soil in certain places, but when soil containing it is inserted into a wound it is able to grow there and manufacture poisons which bring on the symptoms of lock-jaw. Lock-jaw is thus a germ disease, but cases of it have generally nothing whatever to do with contagion.

It is obviously a point of much practical importance to determine whether the germ of quarter-evil belongs to the first or second of these two classes. Does it multiply only in the bodies of animals suffering from quarter-evil, or does it, like the tetanus bacillus, exist in the outer world quite apart from previous cases of quarter-evil? The answer is that the bacillus which causes quarter-evil is in all probability a soil organism, and that cases of the disease are due to what might be called the accidental or occasional introduction of the germ into the bodies of animals. There is abundant experience to warrant the statement that the disease seldom or never spreads directly from one animal to another, as swine fever, glanders, and other contagious diseases do, but it cannot be said that the precise manner in which it is contracted has been conclusively determined.

It would be natural to suppose that in this disease, as in anthrax, animals are generally infected by means of the spores or bacilli which they take in with food or water; but there is a great difficulty in accepting this view of infection, viz., that it is difficult or impossible to convey the disease experimentally to animals by feeding them with materials containing the germs of quarter-evil, even when the animal selected for the experiment is very susceptible and the quantity of germs administered by the mouth enormous. The smallest particle of matter from a quarter-evil tumour may suffice to infect a calf or sheep when it is experimentally injected under the skin; but although various observers have given great quantities of the same material by the mouth, there is only one recorded successful attempt to communicate the disease in this way, and that one is open to considerable doubt.

The only tolerably certain method of infecting animals experimentally with quarter-evil is inoculation under the skin

or into the muscular tissue, and this suggests that a similar method of infection may be responsible for natural cases of the disease, the germs finding entrance to the tissues through insignificant wounds above the feet. Under this view quarter-evil would, with respect to the mode of infection, be assimilated to tetanus or lock-jaw. And it may be observed in this connection that while in the great majority of cases of tetanus the animal has an obvious wound (traumatic tetanus), in a considerable number of instances no wound can be discovered (idiopathic tetanus).

It cannot, however, be truthfully asserted that the view here put forward is entirely free from doubt. The most serious objection that can be raised to its acceptance is that the inflammatory tumour in quarter-evil almost invariably develops at some considerable distance from the feet, whereas if the germs penetrated about the extremities one would expect the lower parts of the limbs to be obviously involved in the disease. But the objection is not insuperable, for there are some reasons for supposing that the muscular tissue of the body furnishes the soil most suitable for the growth and multiplication of quarter-evil bacilli; and hence it is possible that the germs find access to the tissues about the extremities, and are rapidly carried up the limb in the lymph stream, to be arrested in the muscular tissue and there excite inflammatory action.

Animals attacked and Susceptibility.

The bovine species is the one in which quarter-evil is most prevalent, and indeed the disease is rarely diagnosed in any of the other farm animals. The sheep, however, is really more readily infected than the ox when one puts animals to the test of experimental inoculation, and on some farms quarter-evil is responsible for very serious losses among sheep. Occasional instances of alleged quarter-evil in horses and pigs have been recorded in foreign veterinary journals, but few, if any, of these are entirely free from doubt. The dog and cat, and man himself, are not liable to the disease. There is no evidence that susceptibility to the disease varies with the breed, but in the case of cattle it does vary in a remarkable way with the age.

The vast majority of cases occur in cattle under two years old, but it is sometimes met with in those of three or four years of age, and rare instances of it in adult animals have been noted. It has been alleged that new-born calves have a considerable degree of immunity, and that this increases during the first few months of life while the calf is being fed on milk,

but declines when it takes to an herbivorous diet. Experiments made at the Royal Veterinary College have not borne this out, and natural cases of quarter-evil have in many instances been met with in sucking calves. It has also been asserted that the immunity of adult animals is by no means general, but is possessed only by such animals in districts in which the disease occurs among young stock; in other words, that animals of any age brought from a district in which quarter-evil does not occur to one in which it is prevalent will readily contract the disease. The evidence on which this assertion has been made is altogether insufficient. It is scarcely open to doubt that cattle naturally become less susceptible to quarter-evil with advancing age, just as dogs do to distemper. In the sheep age does not appear to bring any immunity, lambs and old sheep contracting the disease indifferently.

It was at one time generally held that young cattle, when rapidly growing and improving in condition, were especially liable to contract quarter-evil, and indeed "fulness of blood" was assigned by the older veterinary authors as the *cause* of the disease. In view of the statements already made regarding the bacterial nature of the disease, it need hardly be said that it is no longer possible to accept rapid growth or excess of blood as the cause of quarter-evil, but the opinion that forced feeding of young stock has something to do with its production has not yet been generally abandoned. The evidence in favour of such a view must be pronounced insufficient. It is not at all certain that even a majority of cases of quarter-evil occur in animals that have rapidly been brought into an unusually high condition, and it is a matter of common observation that lean cattle often contract the disease. Furthermore, veterinary surgeons of considerable experience in districts where quarter-evil is prevalent have come to the conclusion that a more liberal system of feeding young cattle actually tends to reduce the mortality from this disease. Perhaps the one opinion may be set against the other, and the conclusion drawn that susceptibility is practically independent of the animal's general condition. At any rate, there do not appear to be any adequate grounds for keeping young animals in lean condition in order to prevent them from falling victims to quarter-evil.

Signs of the Disease in the Living and in the Dead Animal.

The symptom of quarter-evil which is rarely absent before death, and the only one that is characteristic of the disease, is

the development of a swelling or tumour that is first hot and painful, and soon imparts a crackling sensation (like tissue paper crumbled in the hand) when pressed with the fingers. In most cases this swelling forms on the upper part of a fore or hind limb, but it may be situated on the body or neck, and not rarely two or more swellings are present. The crackling character of these quarter-evil swellings is due to the formation of gas in them, and before the animal dies the skin over them may become dry, parchment-like, and insensitive. When the tumour is formed in connection with one of the limbs the animal is observed to be lame, and this is often the first thing to attract attention, while the swelling is apt to be set down to bruising. At this stage the animal is more or less fevered, has a depressed, anxious expression, and breathes more quickly than in health. In some instances no tumour noticeable during life is formed about either the limbs or body, but such cases are exceptional.

Quarter-evil is one of the most fatal diseases to which cattle are liable. It almost invariably terminates in death within twenty-four hours after the development of the crackling swelling, and in many cases the period of visible illness does not exceed two or three hours. Occasionally, however, an animal may survive for two or three days. In those very rare cases in which recovery takes place the inflammatory tumour generally softens and discharges matter, or large pieces of it may come away as sloughs. Recovery is therefore very slow, and such animals seldom repay their keep.

What has just been said applies mainly to the symptoms and course of the disease in young cattle. In the sheep the disease is still more rapidly fatal. As a rule these animals when attacked with quarter-evil are simply found dead, but sometimes they may be noticed to be dull and lame for some hours or a day before death. In sheep, as in cattle, an inflammatory swelling forms about the legs or body, but this is usually concealed by the fleece. If the animal be examined in the last stage of the disease, the skin over the swollen part will be found to be dark-coloured from congestion, while some liquid often oozes from it, and the wool is easily pulled out.

Animals dead of quarter-evil putrefy very rapidly even at cold seasons of the year, this being a feature which they share with animals dead of anthrax. The older authors generally described the inflammatory swelling of quarter-evil as gangrenous and putrid This, however, was a mistake, for during life the tumour is not at all putrid, and any unpleasant odour which it may be found to possess after death must be set down

to ordinary putrefactive decomposition of the carcass. Nevertheless, the quarter-evil tumour has an unnatural odour in the fresh state, and one which is so characteristic as to be of great value in indicating the nature of the disease from which the animal has died. It is a distinctly sour odour, recalling that of rancid butter, and it is interesting to observe that when the quarter-evil bacillus is cultivated artificially in the laboratory the substances in which it is growing exhale the same sour smell.

When once putrefaction has made considerable progress in a carcass it is often difficult to ascertain whether the animal has died from quarter-evil or not, owing to the impossibility of detecting this peculiar odour. It ought also to be mentioned that, while the crackling character of the tumour is very distinctive of quarter-evil, this peculiarity, as well as the sour odour, is lost when putrefaction sets in, for in that process gas is often formed in the tissues, no matter what the cause of death may have been.

Treatment and Prevention.

It is very doubtful whether any medicinal substance at present known to science is of the least value in saving the life of an animal that is already the subject of quarter-evil. The germ of the disease is one of the most difficult to kill with which we are acquainted, and it would be vain to expect that anything which can with safety be administered to the animal by the mouth could possibly reach the tumour in such a degree of concentration as to destroy the germs growing there. Nor is the heroic method of treatment recommended by the older authors, of cutting deeply into the swelling and rubbing in various substances intended to kill the germs, likely to yield better results; for hardly anything short of mincing the diseased part would enable one to bring the substance employed into direct contact with the bacilli. This hopelessness of remedial treatment in quarter-evil makes it all the more necessary to strive after measures of prevention.

The measures which have been or are still employed to prevent quarter-evil include (1) the administration of purgatives or other medicinal substances, (2) bleeding, (3) setoning, and (4) protective inoculation or vaccination.

Bleeding and the administration of purgatives had their origin in the idea that quarter-evil was caused by a too rapid or superabundant formation of blood. At the present day that line of treatment has been pretty generally abandoned,

and there is no reason to believe that it ever had the effect intended.

The practice of setoning with the object of preventing quarter-evil probably dates from the period when the so-called "humoral" conception of disease was the prevalent one in medicine. The majority of disorders of man and beast were ascribed to the circulation of certain noxious humours, and the insertion of setons and the establishment of issues and discharges were supposed to afford an outlet for these harmful substances. At a later date it was recommended on the ground that it diverted blood to the parts irritated by the seton, and prevented or reduced the intensity of inflammation elsewhere in the body "in accordance with the generally received medical maxim that no two violent inflammations of different character can exist in neighbouring parts at the same time." [1]

At the present day, although none of these explanations of its supposed action can be accepted, the setoning of young cattle is still extensively practised as a means of preventing quarter-evil. Many stock-owners believe in its efficacy, and a considerable number of veterinary surgeons still have faith in it, although they do not profess to be able to explain the way in which it acts. But it seldom or never happens that the advocates of setoning are able to offer conclusive evidence of its value, while many people have had an experience justifying scepticism with regard to its power to prevent quarter-evil.

The experience on which a belief in the efficacy of setoning is founded is generally far too narrow to justify a strong conclusion either way. The evidence usually offered is to the effect that fewer cases of quarter-evil have occurred on particular farms after setoning than in previous years when the operation was not practised, or that during the same period fewer cases of the disease have occurred on farms where the young cattle had been setoned than on others where they had not been so operated upon. It must be pointed out, however, that such evidence, in order to be conclusive, would have to relate to a considerable period of years and a large number of animals; for while there are wide tracts of country in which the disease is common, and others in which it is unknown or rare, it is generally very erratic and inconstant as to the number of victims which it claims on the same farm in different years. There is, therefore, much risk of falling into error when conclusions for or against setoning are drawn from a comparison of the mortality in successive seasons.

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[1] Clater's *Cattle Doctor*, seventh edition, 1832, p. 52.

What is required to enable one to judge of the value of setoning is precise information regarding the death-rate from quarter-evil among a large number of setoned and unsetoned animals grazed together, or fed together in the same premises. Unfortunately no such information is available. On the other hand, there is a good deal of evidence standing to the discredit of setoning. Setoned animals have often been known to die from quarter-evil with the setons still in them. and it has been shown that setoned animals are just as readily infected with quarter-evil (by inoculation) as others of the same class unsetoned.

There is, however, one point in favour of setoning, viz. that it is an operation attended with little or no risk, and it is probably good advice, to those who from their own experience of it have every reason to be satisfied with the results, to recommend them to continue it.

Protective inoculation or vaccination against quarter-evil was introduced about fifteen years ago by Messrs. Arloing, Cornevin, and Thomas, as a means of reducing the losses from the disease in certain districts of France. Since then it has been adopted and very extensively practised in other countries, notably Switzerland and Austria. It is based on the observation that if an animal survives an attack of quarter-evil it is for a considerable period afterwards exempt from a second attack.

Owing to the rarity of recovery from natural attacks of the disease this is not an obvious fact, as it is in the case of small-pox or scarlet fever in man, or foot-and-mouth disease or rinderpest in cattle, but it may be conclusively demonstrated by experiment. It has already been stated that young cattle may be infected with quarter-evil by injecting into them some of the material taken from the crackling swelling of an ordinary case of the disease; but not every animal infected in this way dies. Some recover even after a considerable swelling has formed at the place where the virulent material was introduced under the skin, and it may be shown experimentally that an animal which has thus recovered will afterwards bear without fatal effect a much larger dose of the virulent material than will suffice to kill a companion animal which has never been inoculated. In other words, the first attack has protected the animal.

The problem which naturally presents itself in view of this fact is to discover some means of infecting animals with a mild or non-fatal form of the disease, in the hope that they will afterwards be able to withstand any risks of natural infection to which they are likely to be exposed. The French observers whose names have already been mentioned claim that their method solves this problem. The material which they use to

inoculate or vaccinate the animals is taken from a quarter-evil tumour, and is used. not in its natural state, but with the strength of its contained germs diminished by exposure to heat. And in order to make the operation safer, and at the same time more efficacious, they employ two vaccins, the first very weak, and the second considerably stronger and used about a fortnight after the first. The second operation is the one that mainly confers the protection, but unless the animals had previously been prepared by the first vaccin the second might cause the death of a considerable number of them. The vaccins are generally injected under the skin of the tail, a little above its tip, but sometimes the operation has been modified by omitting the first vaccin, and by inoculating in the region of the shoulder instead of at the tail. As a rule the swelling which forms at the seat of operation and the general disturbance of the animal's health are quite insignificant, but sometimes the swelling spreads up the tail, and the animal dies of quarter-evil.

So much for the nature of the operation. The next points to be considered are: (1) the degree of risk attending it, and (2) the degree of protection which it confers. In judging of these points one is much better circumstanced than in the case of setoning, for official statistics relating to very large numbers of animals are available. Figures compiled for the Sixth International Veterinary Congress, which met at Berne in 1895, show that in nearly half a million inoculations (all in cattle) the average loss from the operation itself was about one animal for each 1,470 inoculated. These figures at first sight appear very reassuring with regard to the safety of the operation, but they ought to be read with others which tell us what are the occasional losses among smaller numbers of animals. Unfortunately these are sometimes very considerable, and in the case of single herds from 2 to 10 per cent. may die from the operation, and this even when precisely the same sample of vaccin has been used simultaneously in a number of other herds without entailing any accident whatever.

Data from which one may estimate the value of inoculation as a means of preventing quarter-evil are also available. In the paper presented to the Sixth International Veterinary Congress, which has been already referred to, statistics are given regarding 192,866 inoculated animals and 315,168 uninoculated animals kept together on the same pastures. Of the former 840, or 0·43 per cent., died from naturally contracted quarter-evil, while among the uninoculated the deaths from the same cause numbered 5,482, or 1·74 per cent. It thus appears that, even adding the deaths occasioned by the operation itself,

the losses from quarter-evil were three and a half times as great among the unvaccinated as among the vaccinated.

Stock-owners will naturally be anxious to know whether the operation of protective inoculation against quarter-evil has been tried in this country, and, if so, with what result. To the knowledge of the writer it has been practised in over a dozen herds, numbering from 5 to 20 animals each. With one exception the result, so far as is known, was entirely satisfactory, no accident having attended the operation, and none of the vaccinated animals having afterwards died from quarter-evil. Unfortunately the exception was a very important one, for in that instance the operation apparently killed 5 of the 15 animals submitted to it, and it was reported that 2 of the surviving animals within a few months afterwards died of quarter-evil. It ought to be added that the very same sample of vaccin used in this instance was employed two days afterwards in a lot of 18 animals without any bad effect. Exactly parallel cases have been reported in Switzerland and elsewhere abroad, and up to the present time no perfectly satisfactory explanation of the uncertainty in the action of the vaccin has been put forward.

The question of inoculation against quarter-evil may be summed up by saying that it is an operation attended with considerable risk, but that it is probably the only method yet known by which protection against the disease can be conferred, and that in the case of farms on which the disease annually causes considerable loss, the danger incidental to the operation may be outweighed by the prospect of the protection which it confers.

In conclusion it may be said that measures of prevention ought to include, but at the present time seldom do include, the exercise of proper care in dealing with the carcasses of animals dead of the disease. As has already been stated, the quarter-evil bacillus apparently occurs naturally in the soil in certain places; but such a number of these germs as are contained within the carcass of an animal dead of the disease are probably never found within the same compass outside the body, and the burial of such a carcass, or the dissolution of an unburied carcass left where the animal died, adds an enormous number of spores to the ground. In this case, unfortunately, putrefaction cannot be relied upon to destroy the germs, and hence, if possible, animals dead of quarter-evil ought to be buried deeply in some place to which cattle and sheep will not afterwards have access.

As a further precaution, if the nature of the disease is certain, the carcass ought not to be skinned or opened, and if that

has been done the place ought to be disinfected. If in the field, this is best accomplished by burning a thick layer of dry straw or litter on the contaminated spot. Disinfection of a contaminated building should be preceded by the removal of the dung and litter to a place where it can be burnt. After that a 5 per cent. solution of carbolic acid in water as near the boiling-point as possible ought to be applied to the floor and lower part of the walls and woodwork to a height of 4 or 5 feet from the ground.

Whenever a case of quarter-evil occurs, it is advisable to turn the surviving animals for a time out of the building or field in which the death has occurred.

Finally, it may be observed that improvement of the land must apparently be reckoned among the means of preventing quarter-evil. Probably the most important of such improvements is draining, but ploughing and crop-growing, as opposed to leaving the land under permanent pasture, may also act beneficially. It is, at any rate, certain that quarter-evil is now an almost unknown disease in many districts where it was at one time very prevalent, and that its decline followed the introduction of better methods of farming.

Difference between Quarter-Evil and Anthrax.

The French name for quarter-evil is *Charbon symptomatique*, and there has been a tendency in this country, especially among medical writers, to adopt the equivalent English term and displace the names "quarter-evil" and "black-leg" by "symptomatic anthrax." Not one single word can be said in favour of such a change in the name of the disease, and many reasons can be urged against it. Chief among them is the fact that the two diseases have scarcely a feature in common, save that they are both very fatal affections of the bovine species. To use the word "anthrax" in connection with quarter-evil almost inevitably fosters the idea that it is somehow related to the disease properly so named, and it is from all points of view desirable, and under the present state of the law necessary, to distinguish between them. The following are some of the striking differences between the two affections:—

1. Both diseases are caused by germs or bacilli, but the respective organisms are very different in size, shape, and biological characters. The anthrax bacillus is motionless, while that of quarter-evil is endowed with the power of movement. The anthrax bacillus requires air or oxygen for its growth and multiplication, but the bacillus of quarter-evil has its growth arrested by the smallest trace of air.

2. In anthrax the bacilli are always, at the time of death, present in enormous numbers in the blood, and comparatively few germs are found in the tissues outside the vessels. In quarter-evil the bacilli are always most abundant in the inflammatory swelling, and they are seldom numerous in the blood, and frequently entirely absent from it, or so few in number as to be undiscoverable with the microscope.

3. Anthrax is a disease which may affect any of the domestic mammals, and is very readily communicated to man himself. It is readily transmitted either by inoculation with the merest trace of blood or by feeding with the raw or imperfectly cooked flesh. The skinning and dressing of an animal dead of anthrax is therefore a very dangerous operation, particularly to those who, like farm labourers, are apt to have small cracks or abrasions about the skin of the hands. Hence, also, it is dangerous to use anthrax carcasses in the raw state for feeding pigs, dogs, or other animals, and in no circumstances can such carcasses be used for human food. On the other hand, it is very doubtful whether quarter-evil is a disease of any of the farm animals except the ox and sheep, and it is certainly not communicable to human beings. There is, therefore, not the least danger in handling or dressing the carcasses of animals dead of the disease, nor would the disease be conveyed to human beings, dogs, or pigs by feeding them with the flesh even if it were raw.[1]

4. Anthrax is a disease which indiscriminately attacks animals of any age, but quarter-evil in cattle is mainly a disease of early life, and is very rare in adult cows or bulls.

5. Anthrax in cattle and sheep is very rarely attended with the development of a swelling about any part of the limbs or body, and in those very exceptional instances in which such a tumour is present it never crackles on pressure, and when it is cut into in the fresh state the liquid that flows from it is almost clear and straw-coloured. On the other hand, the development of a tumour in some part of the body or limbs is almost constant in quarter-evil. This, however, always contains more or less gas before death occurs, and when it is cut into it is found to be dark in colour, while the liquid that trickles from it is always deeply blood-tinged.

6. Under the present state of the law notification of anthrax is imposed upon the owner, but there is no such obligation in the case of quarter-evil.

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[1] For reasons noticed on p. 664, it is highly undesirable to skin or dress a quarter-evil carcass, or to use the flesh for food.

KERRY AND DEXTER CATTLE.

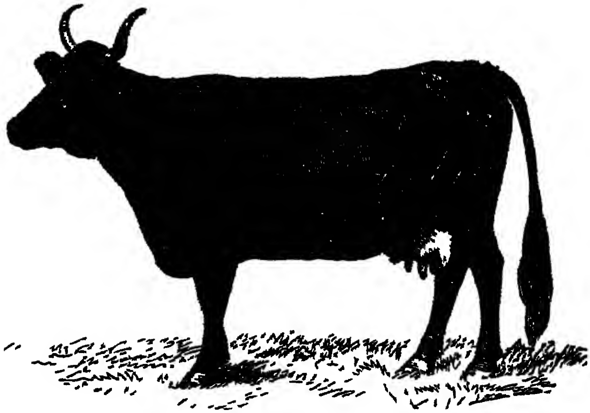
Origin and History.

Various theories have been advanced to account for the different types of cattle, and other domestic animals, that are peculiar to certain districts of the British Isles. For some it is claimed that they are indigenous to their particular localities, whilst others are said to be the descendants of a few ancestors saved from a shipwreck or introduced by foreign invaders. It is pretty certain, however, that many of our breeds of cattle that derive their names from counties or districts, where they have been found "from time immemorial," came from the same parent stock at a not very remote period in English history, their special characteristics being due to the differences of climate, food, and other circumstances which have influenced the size, shape, &c., of successive generations; and, in some cases, to crosses with other breeds.

The Welsh and West Highland cattle are reckoned amongst the oldest breeds of Great Britain, and there is no reason to doubt that the hills and dales of Kerry were stocked with a race of cattle—suited, or that had adapted itself, to the peculiarities of the locality—at as early a period as the breeds to which they give name were grazing on the Welsh mountains or in the Scottish Highlands. However remote their origin there is a tradition—sufficiently corroborated by historical records to show that it is, at any rate, founded on fact—which would account for the remarkable uniformity of Kerry cattle. The tradition is that, more than two thousand years ago, about 200 B.C., a grievous pestilence destroyed all the cattle in Ireland except one bull and one heifer, which survived in a glen in Kerry still called *Gleann-Samhaisch* (the valley of the heifer);[1] and it was formerly believed in Kerry that all the cattle in Ireland had descended from these two animals. Putting aside other improbabilities, the various types of cattle found in different parts of Ireland preclude belief in this comprehensive story, but when we remember the havoc wrought amongst English herds by the visitation of rinderpest in 1866, and consider what the result might have been but for the stringent measures that were so tardily adopted, it is not very difficult to believe in the almost total destruction of the cattle of a district. Something of the kind seems to have happened in Kerry at the time mentioned; and for how many ages before that dire event small black cattle were found there history does not tell us.

[1] Joyce's *Irish Names of Places*, vol. i. p. 167.

The origin of the variety of Kerry cattle known as Dexters is not so far to seek. It is attributed to a gentleman of that name who was an extensive land agent in Kerry early in the present century, and took a practical interest in the improvement of the native cattle; but there is no positive evidence to show the method he adopted for that purpose, whether by importing sires of an English or foreign breed or by selection from native herds. The appearance of the Dexter and the result of crossing it with other breeds seem to indicate that the latter was the course chosen. There were other cattle in Kerry besides the little black cattle of the mountainous districts, and the cattle of Cork and Limerick were within easy reach. Amongst them were small deep-bodied cows, on short legs, with heavy bags of milk; such—though even then becoming rare—



Kerry Cow.

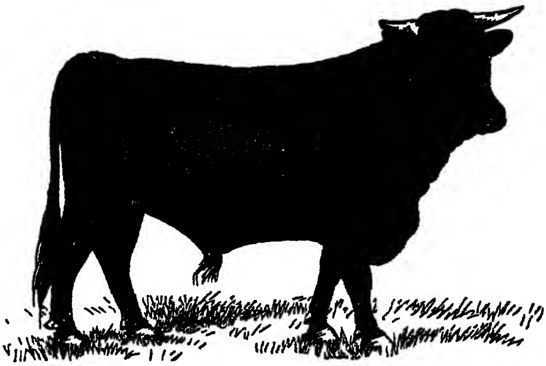
were to be found in those parts within the last forty years, and were known as the "Old Irish Cow." These, crossed with a small Kerry bull, would produce an animal with all the essential characteristics of a modern Dexter.

It is asserted—and there is abundant testimony in support of the assertion—that Dexters are apt to throw misshapen, deformed calves—"monsters" Kerry farmers term them. Such cases, however, are very rare in herds where the mating is carefully attended to.

Special Characteristics.

Till within the last twenty-five years both breeds were generally known as Kerries, the term Dexter being seldom heard outside their native county; and though both breeds are

recognised and fairly described in an article in this Journal in 1872,[1] measurements—evidently those of a Dexter—are there given as the "dimensions of a fat Kerry." Moreover, the colour of the Kerry is there stated to be "either black or red." This is scarcely correct. There are red Kerries, but they are considered sports or accidents, red colours being occasionally dropped from black parents, as is also sometimes the case in herds of Aberdeen Angus cattle; the colour no doubt denoting "back-breeding" to red ancestors in the remote past. Dexters are often red, and when Mr. Pringle's article was written they would be found in the "Kerry" classes at a cattle show; a red Kerry would not now be eligible, as will be seen further on. Omitting this allusion to colour, the distinctive characteristics of the two breeds



Dexter Bull.

as there described cannot well be improved upon; they are the following:—

The Kerry is a light, neat, active animal with fine and rather long limbs, narrow rump, fine small head, lively projecting eye, full of fire and animation, with a fine white cocked horn tipped with black. . . . The Dexter has a round plump body, square behind, legs short and thick with the hoofs inclined to turn in; the head is heavy, and wanting in that fineness and life which the head of the true Kerry possesses; and the horns of the Dexter are inclined to be long and straight.

Put briefly a well-shaped Dexter should resemble a miniature Shorthorn, whereas the Kerry is more of the Jersey type; some authorities, indeed, believe that the neat head and graceful limbs of the Kerry are due to an infusion of Channel Island blood. Thus Arthur Young, writing of a visit to County Kerry in 1776, says:—

[1] *Review of Irish Agriculture*, by R. O. Pringle. Journal R.A.S.E., vol. viii. 2nd series (1872).

The poor people's heifers sell at three years old at 30*s.*; their breed is the little mountain or Kerry cow which upon good land gives a great deal of milk. I have remarked, as I travelled through the country, much of the Alderney breed in some of them.[1]

The colours and markings requisite to qualify Kerries and Dexters for entry in the Herd-Book are clearly defined in the regulations issued by the Royal Dublin Society:—

The Judges are instructed to carefully consider the conformation of each animal submitted for inspection, keeping in view the true types of Kerry and Dexter cattle, and with regard to colour, they are to base their decisions on the following rules:

Kerry Bulls should be pure black; but a small amount of white on the organs of generation or a few white hairs in the tail in animals otherwise of exceptional merit, is not to disqualify.

Kerry cows and heifers should be pure black; but a small amount of white on the udder or a few white hairs in the tail in animals otherwise of exceptional merit, is not to disqualify.

Dexter bulls and cows may be either black or red, with a little white.

This latitude in the markings of the Kerry bull is objected to by some influential English breeders, who would allow a little white on the cow but none on the bull. If that was the rule it would be almost impossible to rear an eligible bull from a cow with a white udder, though she might be the best and most typical Kerry in the herd; as white markings on the dam are nearly always transmitted, in a greater or less degree, to her offspring.

Modern Development and Improvement.

Though cattle of fixed type and untainted lineage could be found in hundreds on the Kerry hills, and many residents in that county, and some in other parts of Ireland, possessed herds the true breeding of which could be traced through many generations, little was known of Kerries and Dexters outside their own county till within the last twenty or twenty-five years. In Kerry, herds of long standing and careful breeding were to be found on the estates of the Knight of Kerry; of Mr. Richard Mahony, Dromore Castle; Mr. James Butler, Waterville; Mr. Pierce Mahony, Kilmorna, and others. Pure-bred Kerries have also been kept for many years by successive Earls of Clonmell, at Bishopscourt, in county Kildare, and Mr. Brinsley Marlay's herd in Westmeath has been long established and has furnished prize winners for a number of years. No one else, however, has done so much to extend the knowledge of these little cattle and get their merits recognised in all parts of the United Kingdom as the late Mr. James Robertson of La Mancha, Malahide,

[1] Arthur Young's *Tour in Ireland* (Hutton's edition, 1892), vol. i. p. 345.

county Dublin. By exhibiting approved specimens of both breeds at English shows he induced many English breeders to found herds of one or the other. Amongst the first to do so were Mr. Martin J. Sutton, in Oxfordshire; the Aylesbury Dairy Company; Captain Swithinbank, Denham Court, Uxbridge; and Mr. Adeane, Babraham, Cambridge. Herds have also been established by His Royal Highness the Prince of Wales at Sandringham; by the Duchess of Newcastle at Clumber; by the Countess de la Warr; by Mr. F. H. Baxendale, Uckfield, Sussex; Mr. F. A. Hordern, Buxted, Sussex; Mr. Sydney Woodiwiss, Westbury Farm, Upminster, Essex; the Express Dairy Company, &c. Mr. Robertson further established an annual sale of Kerries and Dexters on his English farm, which is still continued by his sons. The prices obtained at these sales must be very encouraging to breeders, and plainly show that these little cattle are well worth the extra attention that has been paid them of late years. At the sale held by the Messrs. Robertson at Church Farm, Babraham, Cambridge, on July 13, 1898, sixty-four guineas were given for a two-year-old Dexter heifer, and thirty-nine guineas for a one-year-old Kerry bull; fifty-two animals of both sexes and various ages averaged 21*l.* 11*s.* 3*d.* per head.

Separate classes were provided for Kerries and Dexters by the Royal Dublin Society, for the first time, at the spring show in 1876; the distinction having been previously made only at the shows of the County Kerry Society and of the Royal Agricultural Society of Ireland which then existed. The last cattle show held under the auspices of the old Irish "Royal" was one of Kerries and Dexters at Killarney, on May 21, 1887, a show very memorable in the history of these breeds.

Here animals that had previously won a prize competed in a class by themselves, and at the head of the prize-winning bulls stood *Feale*, bred by Mr. Pierce Mahony, and awarded second prize in his class at the show of the Royal Dublin Society a month before, where he was purchased by Viscount de Vesci for 100*l.*, at that time an unprecedented price for a Kerry.

The first prize bull in the general class, *Morlogh*,—shown by Mr. Pierce Mahony from the Kilmorna herd,—and thirteen heifers in calf to him, were subsequently sold to Sir Thomas Hesketh, Easton Neston, Northamptonshire; and six heifers, some in calf to the same and some to *Ardrigh*, the third prize bull at the Killarney show, were purchased by Sir Thomas Dyke Acland, of Killerton, Devonshire. Some, including Mr. Pierce Mahony himself, would have placed *Ardrigh* first instead of third; and in the same class (says a report written at

the time) "an exceedingly nice bull, though with rather a heavy horn for a yearling, was passed over by the judges without notice." This little animal, exhibited by Mr. Bernard Hayden, was purchased by the late Mr. John Cogan, then manager at Bishopscourt for the fourth Earl of Clonmell, to whom Mr. Cogan expressed the opinion that he had secured the "makings" of the best Kerry bull he had ever seen. The heaviness of the horn, if it ever existed, disappeared with age and condition, and *Paddy Blake*—the bull without honour in his native county—was deemed worthy of the first prize as a two-year-old at the Royal Dublin Society's spring show in 1888, occupied the same position in the all-ages class in 1889, was again first in his class at the Jubilee Show of the Royal Agricultural Society at Windsor in the same year, and, to crown his triumphs, was there awarded the gold medal as the best specimen of the Kerry breed at the show.

Previous to the show at Killarney Mr. Pierce Mahony, with the assistance of the proprietors of the "Farmers' Gazette" (Dublin), had begun a Register of Kerry and Dexter cattle, which was subsequently made the foundation of the Herd-Book now published by the Royal Dublin Society. The first entries in the Register were confined to animals that had received a prize or commendation at any show in the United Kingdom where there is a separate classification for Kerries and Dexters; to this the Herd-Book Committee added qualification by selection. Annual inspections are held at convenient centres in Kerry, and owners can have their herds inspected by arrangement with the Agricultural Superintendent of the Royal Dublin Society. Rules for the guidance of the inspectors in making their selections have been already given (p. 670). Some think that these entries by selection should cease, and that in future the only qualification for entry in the Herd-Book should be approved pedigree. There is much to be said, however, in favour of this method of qualifying. In the first place, it causes the small farmers of Kerry to be more careful in the choice of sires and dams; so that at an inspection held at Sneem, in September 1898, the great majority of the animals entered were deemed eligible, whereas in former years a small minority only used to pass muster. Again, selection gives breeders an opportunity of obtaining fresh blood instead of resorting to close breeding. The Congested District Board has done much towards the improvement of the native Kerry cattle, by selecting bulls that have been entered or are eligible for entry in the Herd-Book and distributing them through the parts of the county most requiring such assistance.

In the first issue of the Register, in 1887, there were entered 40 Kerry bulls, 100 Kerry cows, and ten Dexter cows, and after two more issues the Register was handed over to the Royal Dublin Society and became the basis of the present Kerry and Dexter Herd-Book, the number that had been given to each animal in the Register being made its number in the Herd-Book. The first volume of the Herd-Book was published in 1890, and in it 118 Kerry bulls, 943 Kerry cows, twenty-six Dexter bulls and 210 Dexter cows were registered. The entries in Volume VI., published in January 1898, were 146 Kerry cows, 28 Kerry bulls, 211 Dexter cows and 55 Dexter bulls. The total entries in the six volumes have been 2,434 Kerry cows, 399 Kerry bulls, 1,202 Dexter cows, and 310 Dexter bulls.

The allotment to the two breeds of separate classes at the Jubilee Show of the Royal Agricultural Society in 1889, gave great encouragement to owners of Kerries and Dexters, and it is worthy of note that the Gold Medals given by Her Majesty in person for the best specimen of each breed, were awarded to animals that had been brought direct from Ireland to the show; the champion Kerry being the Earl of Clonmell's *Paddy Blake*, before mentioned, and the champion Dexter Mr. James Robertson's *Limelight.* Both these bulls had been awarded first prizes at the spring show of the Royal Dublin Society in the same year, the Dexter having been there exhibited as *Taney the First*, by Mr. F. Ebrington Ball, of Taney House, Dundrum, county Dublin, and purchased by Mr. Robertson, who changed his name to *Limelight.* At Windsor Mr. Robertson sold him to Captain Swithinbank, of Denham Court, Uxbridge.

By 1892, the native Irish breeds were so firmly established in Great Britain that it was deemed advisable to form an English "Kerry and Dexter Cattle Society." This society has done much to forward the interests of breeders and exporters of Kerry and Dexter cattle, and annually offers a champion prize of ten guineas for the best Kerry animal, and the same for the best Dexter animal, exhibited at the shows of the Royal Agricultural Society. Still further encouragement is promised in 1899.

Consequent on the attention paid to Kerries and Dexters of late years, and the publication of the Herd-Book, a foreign demand has set in and exportations have been made to Canada, the United States, South America, and South Africa; selections have also been made for the Indian and Australian Governments.

Properties as Milk and Beef Producers.

A particular breed of cattle, or other animal, may be brought into notice by means of influential patronage, but can only retain its position in popular estimation by intrinsic merit; this Kerries and Dexters undoubtedly possess. Milk being such an important constituent of the food of the Irish peasantry, the milking properties of the Kerry cow have always been the principal consideration; and the necessities of the owners would cause the little family provider to be milked to the very last drop, and over as many months in the year as possible. This treatment persisted in for many generations has developed the milk-producing powers of the Kerry, just as careless milking, or letting the calves run with their dams, has impaired these powers in some other breeds; and long before the principles of successful breeding were so well understood or carried out as they have been of late years, the most ignorant farmers knew the advantage of rearing heifer calves for the dairy from their best cows, and this we may be sure was the practice of the Kerry peasantry.

An interesting and authentic record of the milking capacity of a herd of Kerries was published by Mr. Pierce Mahony about twelve years ago in the "Live Stock Journal." From 1878 to 1882 Mr. Mahony kept Shorthorns, but finding his land, Kilmorna, county Kerry, not good enough for such heavy stock, he resolved to try his hand with the native cattle. In three or four years he had established a herd of thirty-five good dairy cows, weighing about 6 cwt. each, live weight; and in 1886 five of these little animals averaged 504 gallons of milk each, whilst one of them, the milk of which was kept separate for a test, gave during the summer months 9⅝ lb. of butter per week on grass alone. These results were obtained by selections from the cattle of the district, and were far exceeded when the young stock, carefully bred at Kilmorna, came to maturity.

In yield of butter from a given quantity of milk, numerous tests have shown that the Kerry is surpassed by none except the cows of the Channel Islands. Judges of the characteristics of a good milch cow cannot fail to admire the dairy-like appearance of a typical Kerry; and at the spring show of the Royal Dublin Society in 1897, Lord de Vesci's Kerry cow, *Norah IV.*, was awarded the challenge cup as the best cow in the Ayrshire, Dexter, Kerry, and Red Polled classes.

In proportion to its size, however, the diminutive Dexter far exceeds its more stately relative in milk production; and this

lends force to the suggestion that the breed originated in a cross with "Old Irish" cows that were, generally speaking, very heavy milkers. Mr. Martin J. Sutton's famous Dexter, *Red Rose*, after calving on December 20, 1893, gave up to September 20, 1894, 5 tons 11 cwt. 41 lb. of milk,—more than 1,220 gallons.

The capabilities of Kerries and Dexters as beef-producers are strikingly illustrated at the Christmas fat stock shows. Separate classes are provided for them at the winter show of the Royal Dublin Society, and these furnish some of the best quality beef in the show. At Birmingham the two breeds compete together, and always elicit admiration for their symmetry and excellence of finish. The awards at the great fat stock show of the Smithfield Club, however, afford the best proof that Kerries and Dexters surpass all other small breeds as beef-producers. At that show they compete in the classes for "small cattle," which are open to any breed or cross-breed not specially provided for in the prize-list, the only qualification for entry being that the competitors must not exceed a certain weight. If we turn to the list of awards at Islington in December 1897, we find that the competition in the three classes for small cattle resulted as follows: In the class for steers not exceeding two years old the first prize went to a Dexter-Shorthorn, the second to an Ayrshire; there was no reserve number. In the class for steers not exceeding three years old, the first prize animal was a Dexter-Kerry, the second was out of a Kerry cow by a Dexter-Shorthorn sire, and the "reserve" was a Dexter-Kerry. The first prize heifer was a Devon-Dexter cross, the second a Shorthorn-Ayrshire, and the "reserve" a Dexter.[1]

One can readily believe in the fattening properties of a Dexter, for it looks as if it could easily be made "beef to the heels," but the capabilities of the Kerry in this respect would surprise any one who had only looked with admiration on its graceful, deer-like form and lean head, so indicative of dairy properties. Large droves of Kerries are brought to the Limerick, Ballinasloe, and other fairs in the West of Ireland,

[1] At the Centenary Show of the Smithfield Club the following awards in the "small cattle" section were made on December 5, 1898: Steers not exceeding 2 years old—1st, Shorthorn-Aberdeen cross-bred; 2nd, Dexter sire and Jersey-Shorthorn dam; reserve, Dexter-Shorthorn sire and Dexter dam. Steers 2 to 3 years old—1st, Galloway sire and Highland dam; 2nd, pure-bred Dexter; reserve, pure-bred Kerry. Heifers not exceeding 3 years old—1st, Shorthorn sire and Aberdeen dam; 2nd, Galloway sire and Highland dam; 3rd, Dexter sire and Shorthorn dam; reserve, pure-bred Dexter. Out of the ten animals here enumerated six contained Kerry or Dexter blood.—ED.

whence they are taken to neighbouring and distant grazing districts. Though the true Kerry, reared on its native hills with, perhaps, a brief sojourn in the more fertile valleys, is generally found eligible to compete in "small cattle" classes, its Lilliputian character is soon lost by careful breeding and good treatment. This has been strikingly exemplified at Bishopscourt, the seat of the Earls of Clonmell, in county Kildare, before mentioned. There many generations of Kerries have been reared on good land; and cows that have served their purpose in the dairy, and are turned into beef, not infrequently scale 6 cwt. carcass weight.

Value and Adaptability for Crossing Purposes.

Experiments have been made of Kerry-Jersey crosses, and useful dairy cows, giving a fair supply of very rich milk, have thus been produced, but the improvement on the intrinsic qualities of either breed is not very marked; it is for the purposes of beef production that crosses with the Kerry or Dexter are most valuable. They seem to "nick" well with any of the beef breeds. The Dexter-Shorthorn is a wonderful animal; generally a heavy milker, and carrying a carcass of extraordinary depth and width on very short legs. Crosses of Aberdeen-Angus or Galloway, with either Kerry or Dexter, produce small polled animals that make the highest quality beef when fattened, and of the size and weight most esteemed. Shorthorn with Kerry and Hereford with Kerry give good results. A white Shorthorn bull mated with Kerry heifers is said to produce cattle of the blue-gray colour so much esteemed by some graziers. The Hereford-Kerry is a most interesting animal, unique in appearance. Many excellent specimens of this cross were to be seen some years ago in the county Wicklow, when Major Gardiner kept a herd of Herefords at Glanmore Castle. The young stock, by a pedigree Hereford out of common Kerry cows, were very striking. Compact and level, on short legs, they all had the white face of their sire and the black body of their dams.

In this connection the extraordinary prepotency of the Dexter should be noticed. It is well known in Kerry that calves from Kerry cows by Dexter bulls would often pass for pure Dexters, and in the Journal of the Royal Agricultural Society for 1894 (vol. v., 3rd series, pp. 531–540) Mr. Malden gives a very interesting description of a cross between a Zebu bull and a Dexter heifer. The result of this cross was most remarkable. The portrait of the heifer, thus cross-bred, which illustrates

Mr. Malden's article, shows that the hump of the Zebu has disappeared, and the line from the shoulder to the setting on of the tail is as straight as in a pure Dexter of good characteristic shape. Now the Dexter, as has been said before, seems by general consent to owe its origin to a cross with the Kerry, or at any rate to have been so intermingled with Kerries that the two breeds, now so carefully kept distinct, would probably soon have been inextricably merged in one but for recent research and selection; whereas (as Mr. Malden reminds us) "the Zebu is one of the oldest breeds of cattle, for the most ancient drawings depict the animal as now found."

This Zebu-Dexter cross then seems to afford an instance of a breed, formed in modern times by crossing and selection, having greater prepotency than one as "old as the hills." Such instances, however, are not infrequent in crosses of the Shorthorn with various old established breeds; and these exceptions to the general experience of breeders may no doubt be attributed to the greater constitutional strength of one or other of the animals outweighing the influence of ancient lineage. The same article describes Major Barton's Dexter-Shorthorns before mentioned.

Conclusion.

Kerries and Dexters now occupy an important position in the cattle-raising industry of Great Britain. The Longhorns, that for so many years were the predominant breed in the Midlands, till superseded by the Herefords and Shorthorns, came originally from Ireland.[1] In those days large joints were most esteemed—the bigger the "baron" the bigger the price; and now that small joints are more appreciated it seems that Ireland is again to furnish the class of animal to suit the popular taste. Irish graziers do not fully realise this demand for small well fed animals; their best markets are in Great Britain, and the freight on cattle being charged per head it follows that the cost per cwt. of exporting butchers' beasts is much less in the case of large than of small animals. Nor is the demand for good quality store cattle nearly so well supplied from Ireland as it might be. There are thousands of acres of sound, light land in the south and west of Ireland—well suited to the raising though not to the fattening of cattle—that could be put to no better use than breeding and rearing Kerries and Dexters, or crosses of these and other breeds, for the English market.

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[1] Coleman's *Cattle, Sheep, and Pigs of Great Britain.*

THE WOBURN EXPERIMENTAL FARM.—III.

TABULATED RESULTS FOR EACH YEAR (1877–97) OF

A. Experiments on the Continuous Growth of Wheat.
B. " " " " " Barley.
C. Rotation Experiments—Stackyard Field.
D. " " —Lansome Field.

In two Papers on the Woburn Experimental Farm published last year[1] there was given a general account of the above experiments, together with tables setting out the average results obtained during different periods of their continuation. The conclusions to be drawn were also discussed. The harvest results of each individual year were not, however, set out. This has now been done in the following Tables, which, accordingly, comprise a detailed return of each year's produce from the commencement in 1877 to 1897 inclusive. For convenience, the Tables of average results obtained during particular periods and over the whole time are repeated. A Table giving the Rainfall for each month since January 1882 is added as an Appendix.

To facilitate reference, it may be said that the account of the Experiments on the Continuous Growth of Wheat is given in the Journal, Vol. VIII., Part II., pp. 273–283; that of the Experiments on the Continuous Growth of Barley on pp. 283–292 of the same number; that of the Rotation Experiments (Stackyard Field) in Vol. VIII., Part IV., pp. 624–640; and, lastly, of the Rotation Experiments (Lansome Field) on pp. 640–643 of the last-named number.

The soil of the experimental fields is a light sandy loam of reddish colour, with topsoil varying in depth from 9 inches to 16 inches and a subsoil of lighter and yellow coloured sand. The formation is the Lower Greensand.

The size of the experimental plots in Stackyard Field is, in the Rotation experiments, half-an-acre each; in the continuous Wheat and Barley Experiments one-quarter acre each, with occasional subdivisions into one-eighth acre.

The results are in every case stated as *per acre*. In the corn

[1] Journal R.A.S.E., vol. viii., 1897, pt. ii. and pt. iv.

crops the total weight of corn, the number of bushels (of imperial measure, and not as reckoned on the bushel of any standard weight), and the actual weight per bushel (measure) are given in addition to the straw, offal, &c. No valuation of the corn grown was made previous to 1897.

In regard to the continuous Wheat and Barley Experiments (A & B) it may be well to mention that the same crop is grown every year on the same land, and that the plan of manuring set out in the tables of results is in each case repeated year after year unless otherwise indicated. Mineral manures are applied at the time of sowing the wheat or barley, the soluble nitrogenous salts (ammonia salts and nitrate of soda) are put on as top-dressings in spring, rape cake (plot 10) is spread—finely ground—on the surface, about the end of January, and farmyard manure (plot 11) is made in the early winter in the feeding boxes by bullocks consuming definite quantities of food of known composition; this is subsequently removed, clamped, and spread as a top-dressing in January.

In the case of the plots, 8a, 8b and 9a, 9b, it should be mentioned that up to 1881 (inclusive) there were only the whole plots 8 and 9, to which ammonia salts and nitrate of soda respectively were applied as top-dressings year after year. In 1882 each of these plots was divided into two half-plots; to one of these half-plots (8b, 9b) the top-dressings were applied in 1882 as before, but were left off in 1883, while from the other half-plot (8a, 9a) the top-dressings were omitted in 1882, but were applied again in 1883. This alternation has been carried out since, the half-plot receiving the top-dressing the one year having none the next, and *vice versâ*. It will be noticed how the produce rises and falls at once with the giving or withholding of the nitrogenous manuring.

Plots 10 and 11 were divided in 1882 for the purpose of showing how long it would take to exhaust the residue derived from the previous applications of farmyard manure (1877–81).

In the Rotation Experiments (C) the plan of experiments was altered after 1884. Rotation Experiments (D) were only commenced in 1885.

The general tables giving the average results obtained in each experiment will be found immediately following the individual tables to which they refer.

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A. *Results obtained in the Experiments*

Stackyard Field—

Plot	Manures per acre	1877 Dressed corn Wght.	1877 Dressed corn No. of bush.	1877 Dressed corn Wgt. per bush.	1877 Straw, chaff, &c.	1878 Dressed corn Wght.	1878 Dressed corn No. of bush.	1878 Dressed corn Wgt. per bush.	1878 Straw, chaff, &c.
		lb.		lb.	c. q. lb.	lb.		lb.	c. q. lb.
1	Unmanured	1367	22·1	61·8	20 3 0	943	15·8	60·0	19 2 4
2	Ammonia salts[1] (containing 50 lb. ammonia) . .	2101	34·5	60·9	37 1 0	1053	16·7	63·0	21 1 16
3	Nitrate of soda (containing nitrogen = 50 lb. ammonia)	1931	31·9	60·6	34 1 0	695	11·9	58·4	19 2 0
4	Mixed mineral manures[2] (sulphates of potash, soda, and magnesia, with superphosphate) . . .	1258	20·5	61·4	20 0 0	651	10·4	62·6	18 1 6
5	Mixed mineral manures and ammonia salts (containing 50 lb. ammonia) . .	2062	33·9	60·9	39 0 0	777	13·0	59·8	18 2 20
6	Mixed mineral manures and nitrate of soda (containing nitrogen = 50 lb. ammonia)	1929	32·0	60·3	36 3 14	812	14·0	60·1	23 2 19
7	Unmanured	1275	20·9	61·1	19 3 0	704	12·0	58·6	18 3 9
8a	Mineral manures, and (in alternate years, commencing with 1883) ammonia salts (= 100 lb. ammonia) in addition	—	—	—	—	—	—	—	—
8b	Mineral manures—ammonia salts (= 100 lb. ammonia) yearly to 1882, omitted in 1883 and alternate years	2693	43·4	62·1	48 1 14	1661	27·0	61·5	42 1 0
9a	Mineral manures, and (in alternate years, commencing with 1883) nitrate of soda (containing nitrogen = 100 lb. ammonia) in addition .	—	—	—	—	—	—	—	—
9b	Mineral manures—nitrate of soda (= 100 lb. ammonia) yearly to 1882, omitted in 1883 and alternate years	2394	39·1	61·2	42 3 0	1058	26·1	63·5	42 3 0
10a	1877–81, farmyard manure (= 100 lb. ammonia) . 1882–88, no manure . . 1889, rape cake (= 50 lb. ammonia) . . . 1890–97, no manure . .	—	—	—	—	—	—	—	—
10b	1877–87, farmyard manure (= 100 lb. ammonia) . 1888, no manure . . 1889, rape cake (= 50 lb. ammonia) . . . . 1890–97, rape cake (= 100 lb. ammonia) . .	1030	18·0	60·0	18 2 14	772	12·1	63·8	15 3 2
11a	1877–81, farmyard manure (= 200 lb. ammonia) . 1882–97, no manure . .	—	—	—	—	—	—	—	—
11b	Farmyard manure (= 200 lb. ammonia) every year .	1139	18·9	60·4	20 2 0	990	15·8	63·7	20 0 24

[1] Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.
[2] Mixed mineral manures are, throughout, 3½ cwt. superphosphate of lime, 200 lb. sulphate o potash, 100 lb. sulphate of soda, and 100 lb. sulphate of magnesia per acre.

on the Continuous Growth of Wheat.

Produce per acre.

1879						1880						1881						Plot
Dressed corn			Straw, chaff, &c.			Dressed corn			Straw, chaff, &c.			Dressed corn			Straw, chaff, &c.			
Wght.	No. of bush.	Wgt. per bush.				Wght.	No. of bush.	Wgt. per bush.				Wght.	No. of bush.	Wgt per bush.				
lb.		lb.	c.	q.	lb.	lb.		lb.	c.	q.	lb.	lb.		lb.	c.	q.	lb	
490	10·1	48·5	12	3	14	478	9·6	50·0	13	1	18	1460	25·7	57·2	19	2	27	1
756	14·7	51·2	20	2	22	572	11·5	49·5	15	0	26	1744	31·7	55·0	20	3	24	2
604	12·0	50·2	19	1	21	496	10·5	47·0	15	2	18	2238	41·0	54·6	27	2	1	3
538	11·5	47·0	17	0	22	784	15·3	51·0	19	1	14	1606	28·2	57·0	20	1	10	4
1480	27·3	54·2	35	0	26	1292	26·6	48·6	31	3	12	2322	39·1	59·4	30	0	13	5
1412	25·5	55·0	38	2	22	1204	24·2	47·7	30	0	13	2711	45·2	60·0	36	3	19	6
376	7·5	50·0	13	1	1	688	14·0	49·0	15	2	14	1495	25·0	59·6	19	3	13	7
—	—	—		—		—	—	—		—		—	—	—		—		8a
1603	31·2	51·2	45	2	18	1460	28·4	51·4	32	0	6	2616	43·6	60·0	36	3	19	8b
—	—	—		—		—	—	—		—		—	—	—		—		9a
1418	26·7	52·7	46	2	14	1308	26·4	49·6	37	3	15	2910	48·7	59·7	38	3	5	9b
—	—	—		—		—	—	—		—		—	—	—		—		10a
736	13·4	55·0	19	0	0	766	15·1	50·5	19	2	3	1991	33·2	60·0	24	3	13	10b
—	—	—		—		—	—	—		—		—	—	—		—		11a
1034	18·7	55·2	24	0	20	1008	19·7	51·0	25	2	2	2472	41·2	60·0	32	3	8	11b

Results obtained in the Experiments on

Stackyard Field—

Plot	Manures used	1882 Dressed corn: Weight	1882 Dressed corn: Number of bushels	1882 Dressed corn: Weight per bushel	1882 Straw, chaff, &c.	1883 Dressed corn: Weight	1883 Dressed corn: Number of bushels	1883 Dressed corn: Weight per bushel	1883 Straw, chaff, &c.
				lb	c q lb	lb		lb	c q lb
1	Unmanured	[illegible]	12[illegible]	[illegible]	15 1 2[illegible]	943	16 0	5[illegible] 9	17 [illegible] 16
2	[1] Ammonia salts [illegible] (= 50 lb ammonia)	[illegible]	[illegible]	[illegible]	31 [illegible] 20	1401	2[illegible] 1	[illegible]8 2	27 0 [illegible]
3	Nitrate of soda [illegible] (nitrogen = [illegible])	1[illegible]	[illegible]	[illegible]	32 0 2[illegible]	1[illegible]0	2[illegible]	[illegible]4 1	2[illegible] [illegible] 1
4	[2] Mixed mineral manures [illegible] (sulphate of [illegible] and magnesia [illegible] phosphate)	[illegible]	1[illegible]	[illegible]	[illegible]	1[illegible]1	1[illegible]	5[illegible]	1[illegible] [illegible]
5	Mixed mineral manures and ammonia [illegible] 5[illegible]		1[illegible]	[illegible]	[illegible]3	2[illegible]6	3[illegible]2	58[illegible]	3[illegible] 1 [illegible]
6	Mixed mineral manures and [illegible] nitrate of [illegible] nitrogen = [illegible]0 [illegible]	1[illegible]	[illegible]	[illegible]	30 0 [illegible]1	[illegible]3	[illegible]1	58[illegible]	37 3 2
7	Unmanured	[illegible]30	13[illegible]	[illegible]	1[illegible] 0 1[illegible]	1[illegible]0	18[illegible]	58[illegible]	18 2 [illegible]
8a	Mineral manures and (in alternate years, commencing with 1883) ammonia salts (=100 lb ammonia) in addition	7[illegible]	13 3	58 0	1[illegible] 3 0	27[illegible]2	[illegible]	[illegible]0 3	47 1 12
8b	Mineral manures—ammonia salts (= 1[illegible] lb ammonia) yearly to 1882, omitted in 1883 and alternate [illegible]	2[illegible]	13[illegible]	[illegible]	[illegible] 0 [illegible]	[illegible]	1[illegible]	57[illegible]	1 3 16
9a	Mineral manures and (in alternate years, commencing with 18[illegible]) nitrate of [illegible] (containing nitrogen = 100 lb ammonia) in addition	[illegible]	12[illegible]	[illegible]	1[illegible] 1	[illegible]	1[illegible]	[illegible]7[illegible]	1[illegible] 0 [illegible]
9b	Mineral manures—nitrate of soda (= 1[illegible] lb ammonia) yearly to 1882, omitted in 1883 and alternate years	2 1[illegible]	[illegible]	[illegible]	13 2 [illegible]	11[illegible]	1[illegible]6	[illegible]0	17 3 12
10a	1877–81, farmyard manure (=100 lb ammonia); 1882–88, no manure; 1889, rape cake (=[illegible] ammonia); 1890–97, no manure	[illegible]4	1[illegible]	[illegible]	19 [illegible]	11[illegible]	1[illegible]9	[illegible]9[illegible]	23 1 [illegible]
10b	1877–87, farmyard manure (=100 lb ammonia); 188[illegible], no manure; 1889, rape cake (=[illegible] ammonia); 1890–97, rape cake (= [illegible] ammonia)	[illegible]	1[illegible]	[illegible]	[illegible]1 1	167[illegible]	27[illegible]	[illegible]9 7	2[illegible] 2 [illegible]
11a	1877–81, farmyard manure (=200 lb ammonia); 1882–97, no manure	[illegible]	1[illegible]	[illegible]	[illegible]1 2	12[illegible]	[illegible]	[illegible]	2 3 [illegible]
11b	Farmyard manure (=2[illegible]0 lb ammonia) every year	[illegible]	21[illegible]	[illegible]	30 [illegible] 11	2[illegible]26	[illegible]	[illegible]0 5	7 1 1[illegible]

[1] Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.
[2] Mixed mineral manures are, throughout, [illegible] cwt superphosphate of lime, [illegible]00 lb sulphate of potash, 100 lb sulphate of soda and 100 lb sulphate of magnesia per acre.
[3] Nitrogenous manures omitted. [4] Nitrogenous manures applied.

the CONTINUOUS GROWTH OF WHEAT—*continued.*

Produce per acre.

1884						1885						1886						Plot
Dressed corn			Straw, chaff, &c.			Dressed corn			Straw, chaff, &c.			Dressed corn			Straw, chaff, &c.			
Wght.	No. of bush	Wgt. per bush				Wght.	No. of bush.	Wgt. per bush.				Wght	No. of bush	Wgt. per bush.				
lb.		lb.	c.	q.	lb	lb.		lb.	c.	q.	lb.	lb.		lb.	c	q.	lb	
1362	23·1	59·0	24	3	12	1176	21·3	55·2	17	2	0	688	12·2	56·2	11	3	7	1
2338	40·3	58·0	35	1	22	1767	31·2	56·6	25	2	10	917	17·0	53·9	12	1	8	2
1796	31·9	56·3	29	3	10	1569	28·1	55·8	28	0	21	1079	20·2	53·2	16	2	7	3
1278	21·6	59·0	19	3	10	1243	22·4	55·5	18	3	0	903	15·2	59·4	11	2	16	4
2705	46·1	58·6	39	2	2	2219	37·5	59·1	33	1	14	1279	21·7	58·9	17	1	25	5
2532	42·7	59·2	41	2	20	2282	38·9	58·6	38	0	14	1823	30·8	59·2	25	1	14	6
1577	26·6	59·2	22	3	8	1210	21·9	55·3	16	3	25	803	14·5	55·5	12	0	13	7
1942	32·5[3]	59·7	27	2	0	2376	41·1[4]	57·7	45	2	14	826	14·1[3]	58·5	10	2	4	8a
2884	48·8[4]	59·0	40	3	8	1464	24·7	59·3	20	0	18	2084	34·8[4]	59·9	27	0	2	8b
1257	21·9[3]	57·3	19	3	16	2314	40·0[4]	57·8	53	0	20	896	14·9[3]	60·0	12	1	16	9a
2956	51·0[4]	57·9	53	1	16	1052	18·0[3]	58·5	17	1	16	1996	33·9[4]	58·9	30	3	2	9b
1438	25·1	57·2	25	0	8	1126	19·3	58·4	16	3	2	930	16·2	57·4	11	3	8	10a
1722	29·5	58·4	28	1	24	1510	25·0	60·3	24	0	8	1030	17·9	57·4	14	0	20	10b
1382	24·2	57·0	24	2	16	1192	20·5	58·2	19	2	6	928	16·6	56·0	13	2	6	11a
2226	38·0	58·5	35	3	16	1900	31·8	59·7	29	1	4	1596	27·9	57·2	18	2	26	11b

[3] Nitrogenous manures omitted. [4] Nitrogenous manures applied.

Results obtained in the Experiments on

Stackyard Field—

Plot	Manures per acre	1887 Dressed corn Wght.	1887 Dressed corn No. of bush.	1887 Dressed corn Wgt. per bush.	1887 Straw, chaff, &c.	1888 Dressed corn Wght.	1888 Dressed corn No. of bush.	1888 Dressed corn Wgt. per bush.	1888 Straw, chaff, &c.
		lb.		lb.	c. q. lb.	lb.		lb.	c. q. lb.
1	Unmanured	1290	21·3	60·4	17 3 11	669	12·5	53·4	13 0 20
2	[1] Ammonia salts (containing 50 lb. ammonia)	1541	26·1	59·1	22 1 14	893	17·1	52·1	19 3 16
3	Nitrate of soda (containing nitrogen=50 lb. ammonia)	2071	35·0	59·2	29 0 10	963	20·0	48·0	21 3 15
4	[2] Mixed mineral manures (sulphates of potash, soda, and magnesia, with superphosphate)	1063	17·7	60·1	16 2 16	603	11·2	53·7	15 1 6
5	Mixed mineral manures and ammonia salts (containing 50 lb. ammonia)	1697	29·7	57·1	28 3 26	1352	24·2	55·9	23 1 19
6	Mixed mineral manures and nitrate of soda (containing nitrogen=50 lb. ammonia)	2373	40·2	59·1	37 1 22	1618	30·6	52·8	30 2 2
7	Unmanured	1378	24·6	55·9	19 2 26	475	9·4	50·5	14 0 21
8a	Mineral manures, and (in alternate years, commencing with 1883) ammonia salts (=100 lb. ammonia) in addition	2050	36·5[4]	56·2	36 3 12	1056	18·5[3]	57·1	19 1 4
8b	Mineral manures—ammonia salts (= 100 lb. ammonia) yearly to 1882, omitted in 1883 and alternate years	1514	27·4[3]	55·3	23 0 2	1590	29·6[4]	53·8	37 2 0
9a	Mineral manures, and (in alternate years, commencing with 1883) nitrate of soda (containing nitrogen = 100 lb. ammonia) in addition	2526	43·8[4]	57·7	45 2 8	684	12·3[3]	55·7	13 1 26
9b	Mineral manures—nitrate of soda (=100 lb. ammonia) yearly to 1882, omitted in 1883 and alternate years	1200	20·3[3]	59·2	17 2 8	1508	30·0[4]	50·2	36 3 22
10a	1877–81, farmyard manure (=100 lb. ammonia); 1882–88, no manure; 1889, rape cake (=50 lb. ammonia); 1890–97, no manure	1510	26·4	57·2	21 0 8	686	12·9	53·0	14 2 20
10b	1877–87, farmyard manure (=100 lb. ammonia); 1888, no manure; 1889, rape cake (=50 lb. ammonia); 1890–97, rape cake (=100 lb. ammonia)	1716	30·2	56·8	25 3 22	934	16·6	56·2	17 1 24
11a	1877–81, farmyard manure (=200 lb. ammonia); 1882–97, no manure	1578	27·8	56·7	22 1 24	826	15·2	54·5	14 3 18
11b	Farmyard manure (=200 lb. ammonia) every year	2094	36·9	56·8	31 2 4	1336	23·2	57·5	22 2 10

[1] Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.
[2] Mixed mineral manures are, throughout, 3½ cwt. superphosphate of lime, 200 lb. sulphate of potash, 100 lb. sulphate of soda, and 100 lb. sulphate of magnesia per acre.
[3] Nitrogenous manures omitted.
[4] Nitrogenous manures applied.

the Continuous Growth of Wheat—*continued.*

Produce per acre.

1889						1890						1891						Plot
Dressed corn			Straw, chaff, &c.			Dressed corn			Straw, chaff, &c.			Dressed corn			Straw, chaff, &c.			
Wght.	No. of bush.	Wgt. per bush.				Wght.	No. of bush.	Wgt. per bush.				Wght.	No. of bush.	Wgt. per bush.				
lb.		lb.	c.	q.	lb.	lb.		lb.	c.	q.	lb.	lb.		lb.	c.	q.	lb.	
775	13·1	59·2	14	2	2	827	14·1	58·7	14	2	22	847	14·5	58·4	15	2	19	1
1552	26·3	59·1	26	1	27	1445	24·7	58·4	19	2	15	1659	28·5	58·1	23	2	17	2
1042	18·9	55·1	23	0	2	1727	31·2	55·3	26	3	14	1454	27·5	52·8	28	0	0	3
729	12·2	59·7	15	1	27	898	15·4	58·4	15	0	6	975	17·0	57·3	17	0	5	4
2130	35·5	59·9	37	3	11	1829	30·3	60·2	26	3	0	1942	33·2	58·5	32	2	19	5
1771	30·5	58·0	36	2	1	1967	34·1	57·6	31	1	4	2417	42·7	56·6	39	1	8	6
779	13·9	55·7	14	0	4	918	15·7	58·3	14	2	24	927	16·4	56·5	15	3	1	7
2578	44·4[4]	58·0	45	1	6	1568	26·0[3]	60·3	23	0	18	2732	48·4[4]	56·5	42	2	14	8a
1240	21·2[3]	58·5	19	0	6	2350	39·0[4]	60·2	31	2	2	1318	22·5[3]	58·5	22	1	14	8b
1814	32·8[4]	55·2	42	3	8	1008	18·2[3]	58·6	17	2	22	1860	34·8[4]	53·5	44	3	2	9a
642	11·4[3]	56·2	11	3	14	2358	42·3[4]	55·7	38	0	12	1078	19·3[3]	55·7	17	3	24	9b
1158	19·8	58·4	20	2	6	1050	17·6	59·6	15	2	16	1076	19·0	56·7	16	2	26	10a
1416	23·8	59·4	25	0	10	1830	30·4	60·2	28	1	26	2056	35·6	57·7	32	3	18	10b
922	15·8	58·2	15	2	0	1178	19·7	59·6	18	1	14	1276	22·1	57·7	18	0	4	11a
1796	30·5	58·9	27	2	16	1736	29·5	58·7	31	1	22	2194	38·2	57·4	32	1	20	11b

[3] Nitrogenous manures omitted. [4] Nitrogenous manures applied.

Results obtained in the Experiments on

Stackyard Field—

Plot	Manures per acre	1892 Dressed corn Wg'ht	1892 Dressed corn No of bush	1892 Dressed corn Wgt per bush	1892 Straw, chaff, &c.	1893 Dressed corn Wght	1893 Dressed corn No of bush	1893 Dressed corn Wgt per bush	1893 Straw, chaff, &c.
		lb		lb	c q lb	lb		lb.	c q lb
1	Unmanured .	627	11·7	53·7	12 3 10	557	8·9	62·5	7 0 4
2	[1] Ammonia salts (containing 50 lb ammonia)	566	11·4	49·7	14 2 20	577	9·3	62·1	7 0 13
3	Nitrate of soda (containing nitrogen = 50 lb ammonia)	857	17·5	49·0	19 3 2	698	11·2	62·5	7 3 23
4	[2] Mixed mineral manures (sulphates of potash, soda, and magnesia, with superphosphate) . .	699	12·7	54·9	12 2 14	609	9·6	63·4	8 1 21
5	Mixed mineral manures and ammonia salts (containing 50 lb ammonia) . .	1485	26·2	56·7	23 3 14	829	13·1	63·3	9 1 18
6	Mixed mineral manures and nitrate of soda (containing nitrogen = 50 lb. ammonia)	1233	23·4	52·6	25 3 20	829	13·1	63·2	9 1 7
7	Unmanured	866	15·6	55·5	14 0 4	762	12·1	63·0	8 3 9
8a	Mineral manures, and (in alternate years, commencing with 1883) ammonia salts (=100 lb. ammonia) in addition	978	17·7[3]	55·3	17 3 12	1120	17·7[4]	63·1	11 1 24
8b	Mineral manures—ammonia salts (= 100 lb. ammonia) yearly to 1882, omitted in 1883 and alternate years	1982	34·2[4]	58·0	30 1 12	1028	16·4[3]	62·7	11 2 14
9a	Mineral manures, and (in alternate years, commencing with 1883) nitrate of soda (containing nitrogen = 100 lb ammonia) in addition	892	15·6	57·0	15 0 10	1092	17·5[4]	62·4	10 2 4
9b	Mineral manure—nitrate of soda (= 100 lb ammonia) yearly to 1882, omitted in 1883 and alternate years	1148	22·8[4]	50·2	26 1 22	882	13·9	63·5	9 2 12
10a	1877–81, farmyard manure (=100 lb ammonia) . 1882–88, no manure . 1889, rape cake (=50 lb ammonia) . . . 1890–97, no manure .	628	11·6	54·2	12 1 20	796	12·8	62·0	8 2 10
10b	1877–87, farmyard manure (=100 lb ammonia) . 1888, no manure 1889, rape cake (=50 lb. ammonia) 1890–97, rape cake (=100 lb ammonia)	1380	25·1	55·0	25 0 8	838	13·2	63·5	10 1 6
11a	1877–81, farmyard manure (=200 lb ammonia) 1882–97, no manure	832	14·9	55·5	13 1 2	1166	18·5	62·9	12 0 0
11b	Farmyard manure (=200 lb ammonia) every year .	1424	25·3	56·3	25 1 2	1172	18·5	63·2	14 0 6

[1] Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.

[2] Mixed mineral manures are, throughout, 3½ cwt superphosphate of lime, 200 lb sulphate of potash 100 lb sulphate of soda, and 100 lb. sulphate of magnesia per acre

[3] Nitrogenous manures omitted. [4] Nitrogenous manures applied

the CONTINUOUS GROWTH OF WHEAT—*continued.*

Produce per acre.

1894 Dressed corn Weight	1894 Dressed corn No. of bush.	1894 Dressed corn Wgt. per bush.	1894 Straw, chaff, &c.	1895 Dressed corn Weight	1895 Dressed corn No. of bush.	1895 Dressed corn Wgt. per bush.	1895 Straw, chaff, &c.	1893 Dressed corn Weight	1893 Dressed corn No. of bush.	1893 Dressed corn Wgt. per bush.	1893 Straw, chaff, &c.	1897 Head corn Weight	1897 Head corn No. of bush.	1897 Head corn Wgt. per bush.	1897 Tail corn Weight	1897 Straw, chaff, &c.	Plot
lb.		lb.	c. q. lb.	lb.		lb.	c. q. lb.	lb.		lb.	c. q. lb.	lb.		lb.	lb.	c. q. lb.	
850	14·5	58·3	13 0 19	599	9·8	61·2	6 3 10	403	6·5	62·0	7 2 24	451	7·1	63·5	35	8 1 2	1
2730	45·5	59·7	10 1 12	802	13·2	60·9	10 1 7	1274	20·4	62·3	15 3 10	735	11·8	62·4	59	10 0 1	2
2071	36·2	57·3	36 3 3	916	15·2	60·4	10 3 23	1135	19·6	57·7	18 0 7	609	10·6	57·2	121	16 2 12	3
795	13·4	59·5	13 0 12	565	9·3	61·1	8 0 16	473	7·6	60·5	7 2 24	463	7·7	63·0	32	10 2 16	4
3327	54·4	61·2	44 3 11	923	15·3	60·9	12 0 8	1764	27·9	63·3	21 0 19	1292	20·6	62·6	81	10 0 9	5
2500	42·7	58·5	37 2 21	1235	20·1	61·4	13 3 26	1423	23·9	59·5	19 0 15	1052	17·6	59·9	136	20 1 19	6
931	15·5	60·2	14 1 18	722	11·8	61·2	8 3 26	590	9·8	61·0	7 3 2	482	7·7	62·7	31	8 0 8	7
3156	51·5[3]	61·2	30 0 16	1052	17·2[4]	62·7	11 3 0	1670	26·9[3]	62·2	22 1 4	1524	24·2[4]	63·0	98	21 0 4	8a
3552	58·2[4]	61·0	46 1 12	1060	17·0	62·2	12 3 20	1938	30·5	63·6	23 1 4	1048	16·4	63·7	56	16 0 22	8b
1460	24·6	59·4	20 0 20	1231	20·1[4]	61·2	14 3 6	728	11·9	60·7	10 1 4	1238	20·7[4]	59·7	120	23 0 26	9a
2176	37·7[4]	57·6	36 2 10	831	13·4[4]	62·0	10 0 4	1504	25·9[4]	58·0	22 0 12	618	9·8	63·0	16	8 3 14	9b
1238	20·7	59·9	17 0 10	816	13·3	61·2	8 3 11	731	11·9	61·5	10 2 22	580	9·3	62·2	42	9 1 14	10a
2610	44·2	59·7	40 1 8	1090	17·8	61·2	11 0 10	1452	23·6	62·2	19 3 24	1378	22·4	61·6	90	22 1 16	10b
1272	21·9	57·9	19 3 4	868	14·1	61·5	9 3 6	730	11·9	61·5	11 0 4	536	8·6	62·2	12	9 1 16	11a
1820	31·3	58·2	34 3 8	1450	23·5	61·6	17 1 10	1302	21·2	61·5	18 2 6	978	16·0	61·2	92	18 1 24	11b

[3] Nitrogenous manures omitted.

[4] Nitrogenous manures applied.

SUMMARY OF

CONTINUOUS WHEAT

Stackyard Field—

Area 2¾ acres. Plots ⅛ acre

Plot	Manures (applied annually) per acre	Average of first 10 years 1877–86					Average of second 10 years—1887–96				
		Bush. of corn	Wght. of corn per bush.	Weight of straw, chaff, &c.			Bush. of corn	Wght. of corn per bush.	Weight of straw, chaff, &c.		
			lb.	c.	q.	lb.		lb.	c.	q.	lb.
1	Unmanured	16·8	56·4	17	2	14	12·7	58·8	12	1	11
2	[1] Ammonia salts (=50 lb. ammonia)	25·4	56·5	24	3	0	22·2	58·1	20	0	12
3	Nitrate of soda (=50 lb. ammonia)	24·1	54·8	25	1	0	23·2	55·7	22	0	27
4	[2] Mixed mineral manures (superphosphate, sulphates of potash, soda, and magnesia) . .	17·7	56·8	18	1	0	12·6	58·9	12	3	26
5	Mixed mineral manures and ammonia salts (=50 lb. ammonia)	31·5	57·8	32	0	0	29·0	59·7	26	0	12
6	Mixed mineral manures and nitrate of soda (=50 lb. ammonia)	32·4	57·8	34	2	14	30·1	57·9	28	0	13
7	Unmanured	17·4	56·3	17	0	14	14·5	57·8	13	0	27
8a	Mineral manures, and (in alternate years) ammonia salts (=100 lb. ammonia)	38·8	58·2	42	0	14	35·6	59·3	31	2	23
8b	Mineral manures—ammonia salts being omitted in alternate years	20·4[3]	58·6[3]	17	3	14[3]	24·5	59·3	22	0	19
9a	Mineral manures, and (in alternate years) nitrate of soda (=100 lb. ammonia)	37·2	57·8	44	1	0	30·8	56·2	31	3	13
9b	Mineral manures—nitrate of soda being omitted in alternate years	17·1[3]	58·2[3]	17	0	14[3]	16·1	58·8	14	1	12
10a	No manure, 1882–88, after farmyard manure (=100 lb. ammonia) yearly, 1877–81 . . .	19·3	56·9	18	3	10	—	—		—	
	No manure, 1890–96, after rape cake (=50 lb. ammonia) one year, 1889, and farmyard manure yearly, 1877–81, as above .	—	—		—		15·3	59·3	12	3	13
10b	Farmyard manure (=100 lb. ammonia) applied every year, 1877–1887	21·7	58·1	22	0	23	—	—		—	
	Rape cake (=100 lb. ammonia) applied every year, 1890–96 7.	—	—		—		27·2	59·9	24	1	22
11a	No manure, 1882–96, after farmyard manure (=200 lb. ammonia) yearly, 1877–81 . . .	19·6[3]	58·1[3]	19	3	24[3]	18·2	58·6	15	2	2
11b	Farmyard manure (=200 lb. ammonia) applied every year .	26·7	58·4	27	2	4	27·8	59·0	25	2	8

[1] Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.
[2] Mineral manures are, throughout, 3½ cwt. superphosphate of lime, 200 lb. sulphate of potash, 100 lb. sulphate of soda, and 100 lb. sulphate of magnesia, per acre.
[3] Average of five years only (1882–1886).

RESULTS.

Experiments.

Produce per acre.

each. Commenced 1876.

Average of 20 years—1877-1896

Highest yield of corn	Lowest yield of corn	Mean of highest and lowest yield of corn	General mean yield of corn	Weight of corn per bushel	Weight of straw, chaff, &c.			Plot
bush.	bush.	bush.	bush.	lb.	c.	q.	lb.	
25·7	6·5	16·1	14·7	57·6	14	3	26	1
45·5	9·3	27·4	23·8	57·3	22	1	20	2
41·0	10·5	25·8	23·6	55·2	23	2	27	3
28·2	7·8	18·0	15·1	57·8	15	2	13	4
54·4	13·0	33·7	30·2	58·7	29	0	6	5
45·2	13·1	29·1	31·2	57·8	31	1	13	6
26·6	7·5	17·0	15·9	57·0	15	0	20	7
58·2	17·2	37·7	37·2	58·7	36	3	18	8a
51·5	13·3	32·4	23·1*	59·1*	20	2	27*	8b
51·0	17·5	34·2	34·0	57·0	38	0	6	9a
24·6	11·4	18·0	16·4*	58·6*	15	1	3*	9b
—	—	—	—	—	—			10a
—	—	—	—	—	—			
—	—	—	—	—	—			10b
—	—	—	—	—	—			
27·8	11·9	17·8	18·7*	58·4*	17	0	0*	11a
41·2	15·8	28·5	27·2	58·7	26	2	6	11b

* Average of fifteen years only (1882–96).

B. *Results obtained in the Experiments*

Stackyard Field—

Plot	Manures per acre	1877 Dressed corn Wght.	1877 Dressed corn No. of bush.	1877 Dressed corn Wgt. per bush.	1877 Straw, chaff, &c.	1878 Dressed corn Wght.	1878 Dressed corn No. of bush.	1878 Dressed corn Wgt. per bush.	1878 Straw, chaff, &c.
		lb.		lb.	c. q. lb.	lb.		lb.	c. q. lb.
1	Unmanured	1210	22·2	54·4	15 3 14	1226	24·0	51·0	16 0 16
2	[1] Ammonia salts (containing 50 lb. ammonia) . .	1935	35·2	54·3	23 2 0	1864	36·0	51·8	23 2 8
3	Nitrate of soda (containing nitrogen = 50 lb. ammonia)	1163	20·7	54·7	13 1 0	1632	33·1	49·3	23 3 2
4	[2] Mixed mineral manures (sulphates of potash, soda, and magnesia, with superphosphate) . . .	[illegible]	15·4	53·9	11 1 14	1204	23·7	50·8	15 2 0
5	Mixed mineral manures and ammonia salts (containing 50 lb. ammonia) . .	2129	38·5	55·3	25 2 0	1851	36·7	50·4	29 0 5
6	Mixed mineral manures and nitrate of soda (containing nitrogen = 50 lb. ammonia)	1818	33·2	54·7	22 1 14	2145	42·6	50·3	28 3 11
7	Unmanured	1084	19·9	51·0	12 0 0	951	19·3	49·7	12 1 4
8a	Mineral manures, and (in alternate years, commencing with 1883) ammonia salts (=100 lb. ammonia) in addition	—	—	—	—	—	—	—	—
8b	Mineral manures—ammonia salts (=100 lb. ammonia) yearly to 1882, omitted in 1883 and alternate years	2971	52·6	56·1	35 1 0	2592	43·7	59·1	38 0 16
9a	Mineral manures, and (in alternate years, commencing with 1883) nitrate of soda (containing nitrogen = 100 lb. ammonia) in addition	—	—	—	—	—	—	—	—
9b	Mineral manures—nitrate of soda (=100 lb. ammonia) yearly to 1882, omitted in 1883 and alternate years	2742	49·9	55·[illegible]	32 0 14	2466	44·8	55·6	39 0 7
10a	1877–81, farmyard manure (=100 lb. ammonia) . 1882–88, no manure . 1889, rape cake (=50 lb. ammonia) . . . 1890–97, no manure . .	—	—	—	—	—	—	—	—
10b	1877–87, farmyard manure (=100 lb. ammonia) . 1888, no manure . 1889, rape cake (=50 lb. ammonia) . . . 1890–97, rape cake (=100 lb. ammonia) . . .	[illegible]	18·1	55·6	11 0 14	1096	22·7	48·3	16 1 24
11a	1877–81, farmyard manure (=200 lb. ammonia) . 1882–97, no manure . .	—	—	—	—	—	—	—	—
11b	Farmyard manure (=200 lb. ammonia) every year .	1436	26·5	51·2	15 2 0	1534	29·7	51·6	19 2 0

[1] Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.

[2] Mixed mineral manures are, throughout, 3½ cwt. superphosphate of lime, 200 lb. sulphate of potash, 100 lb. sulphate of soda, and 100 lb. sulphate of magnesia per acre.

on the Continuous Growth of Barley.

Produce per acre.

1879						1880						1881						Plot
Dressed corn			Straw, chaff, &c.			Dressed corn			Straw, chaff, &c.			Dressed corn			Straw, chaff, &c.			
Wght.	No. of bush.	Wgt. per bush.				Wght.	No. of bush.	Wgt. per bush.				Wght.	No. of bush.	Wgt. per bush.				
lb.		lb.	c.	q.	lb.	lb.		lb.	c.	q.	lb.	lb.		lb.	c.	q.	lb.	
972	19·1	50·2	13	1	5	1708	32·5	52·5	17	2	0	1677	34·1	49·2	16	0	11	1
1368	27·1	50·5	18	0	11	2056	40·0	51·5	21	1	4	2230	44·5	50·1	21	0	22	2
1051	21·5	49·0	17	1	20	2344	45·1	52·0	26	2	5	2429	49·5	49·1	24	1	22	3
626	11·8	53·0	10	0	11	1152	22·4	51·5	13	3	18	1628	33·6	48·5	14	1	10	4
1495	28·7	52·0	21	2	5	2618	50·2	52·3	27	0	9	2284	45·7	50·0	22	3	26	5
1426	27·3	52·2	20	3	26	2566	48·9	52·5	31	3	0	2677	53·3	50·2	29	1	10	6
664	13·0	51·0	11	0	6	1091	21·0	52·0	13	0	15	1611	33·2	48·6	14	2	11	7
—	—	—		—		—	—	—		—		—	—	—		—		8a
1489	30·8	51·3	23	0	26	2535	48·8	52·0	30	3	15	2672	53·1	50·3	27	2	13	8b
—	—	—		—		—	—	—		—		—	—	—		—		9a
1850	37·0	50·0	27	0	12	2228	44·6	50·0	36	0	20	2842	56·8	50·0	31	0	12	9b
—	—	—		—		—	—	—		—		—	—	—		—		10a
949	18·2	52·0	13	0	6	1857	35·7	52·0	19	3	13	2255	44·8	50·3	23	1	26	10b
—	—	—		—		—	—	—		—		—	—	—		—		11a
1413	27·2	52·0	15	1	21	2311	44·2	52·5	23	1	21	2649	50·7	52·3	28	0	11	11b

Results obtained in the Experiments on

Stackyard Field—

Plot	Manures per acre	1882 Dressed corn Wght.	1882 Dressed corn No. of bush.	1882 Dressed corn Wgt. per bush.	1882 Straw, chaff, &c.	1883 Dressed corn Wght.	1883 Dressed corn No. of bush.	1883 Dressed corn Wgt. per bush.	1883 Straw, chaff, &c.
		lb.		lb.	c. q. lb.	lb.		lb.	c. q. lb.
1	Unmanured	1723	33·2	51·9	20 1 11	1596	30·3	52·7	18 2 14
2	[1] Ammonia salts (containing 50 lb. ammonia)	2309	44·8	51·5	29 2 0	2684	50·6	53·0	30 1 4
3	Nitrate of soda (containing nitrogen = 50 lb. ammonia)	2594	49·8	52·1	31 2 10	2708	51·1	53·0	37 1 4
4	[2] Mixed mineral manures (sulphates of potash, soda, and magnesia, with superphosphate)	1203	23·1	52·0	15 2 24	1470	28·0	52·5	17 1 20
5	Mixed mineral manures and ammonia salts (containing 50 lb. ammonia)	2590	47·6	54·4	33 3 14	2810	50·9	55·2	32 1 26
6	Mixed mineral manures and nitrate of soda (containing nitrogen = 50 lb. ammonia)	2743	50·5	54·2	36 0 24	2948	55·8	52·8	43 2 16
7	Unmanured	1383	27·5	50·2	19 3 17	1281	22·8	51·6	13 3 22
8a	Mineral manures, and (in alternate years, commencing with 1883) ammonia salts (= 100 lb. ammonia) in addition	1998	37·7[3]	52·9	25 0 26	3368	62·5[4]	53·9	32 1 8
8b	Mineral manures—ammonia salts (= 100 lb. ammonia) yearly to 1882, omitted in 1883 and alternate years	2756	52·7[4]	52·3	50 3 18	1914	35·2[3]	54·3	19 3 0
9a	Mineral manures, and (in alternate years, commencing with 1883) nitrate of soda, (containing nitrogen = 100 lb. ammonia) in addition	1988	37·0[3]	53·7	19 0 20	3126	60·9[4]	51·3	49 3 12
9b	Mineral manures—nitrate of soda (= 100 lb. ammonia) yearly to 1882, omitted in 1883 and alternate years	3442	66·8[4]	51·5	48 3 14	1944	35·9[3]	54·2	22 0 16
10a	1877–81, farmyard manure (= 100 lb. ammonia); 1882–88, no manure; 1889, rape cake (= 50 lb. ammonia); 1890–97, no manure	2392	39·6	52·8	19 1 20	1746	33·4	52·2	17 2 12
10b	1877–87, farmyard manure (= 100 lb. ammonia); 1888, no manure; 1889, rape cake (= 50 lb. ammonia); 1890–97, rape cake (= 100 lb. ammonia)	2136	40·7	52·4	23 2 12	2038	38·8	52·5	22 3 20
11a	1877–81, farmyard manure (= 200 lb. ammonia); 1882–97, no manure	2056	38·3	53·7	21 1 18	1982	38·0	52·2	24 3 24
11b	Farmyard manure (= 200 lb. ammonia) every year	2212	41·1	53·8	22 0 22	2710	51·3	53·1	34 1 12

[1] Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.
[2] Mixed mineral manures are, throughout, $3\frac{1}{2}$ cwt. superphosphate of lime, 200 lb. sulphate of potash, 100 lb. sulphate of soda, and 100 lb. sulphate of magnesia per acre.
[3] Nitrogenous manures omitted.
[4] Nitrogenous manures applied.

the CONTINUOUS GROWTH OF BARLEY—*continued.*

Produce per acre.

1884 Dressed corn Wght.	1884 Dressed corn No. of bush.	1884 Dressed corn Wgt. per bush.	1884 Straw, chaff, &c.			1885 Dressed corn Wght	1885 Dressed corn No. of bush.	1885 Dressed corn Wgt per bush.	1885 Straw, chaff, &c.			1886 Dressed corn Wght.	1886 Dressed corn No. of bush	1886 Dressed corn Wgt. per bush	1886 Straw, chaff, &c.			Plot
lb.		lb	c.	q.	lb	lb.		lb.	c.	q.	lb.	lb.		lb.	c	q.	lb.	
1749	32·8	54·1	16	1	16	1102	21·8	50·5	11	2	18	997	19·2	51·9	12	1	9	1
2808	51·2	54·8	26	1	2	1683	34·5	48·8	22	0	17	1571	29·8	52·8	15	2	19	2
2806	51·6	54·3	28	2	12	1897	37·2	50·9	20	3	5	2025	38·4	52·7	21	0	27	3
1717	32·1	53·5	16	1	26	1046	21·0	49·7	10	1	14	974	18·7	52·1	10	0	25	4
2981	51·9	57·4	27	2	24	2519	48·0	52·5	25	1	14	1739	32·1	53·9	15	3	26	5
3178	57·8	55·0	37	0	8	2754	50·3	54·7	27	2	6	2149	40·2	53·4	22	3	14	6
1756	33·3	52·7	18	3	2	1118	22·5	49·5	11	0	9	917	18·2	50·4	9	0	20	7
2616	46·4[3]	56·3	26	1	8	3040	58·7[4]	51·8	32	2	10	1404	26·5[3]	52·9	15	0	24	8a
3324	59·3[4]	56·0	39	3	0	2038	39·3	51·8	18	3	14	2354	44·1[4]	53·4	23	3	24	8b
2082	37·2[3]	55·0	19	2	24	3488	64·5[4]	54·1	39	2	14	1478	27·7[3]	53·3	14	3	24	9a
2078	55·4[4]	53·7	47	3	16	1812	34·8[3]	53·0	15	1	4	2804	52·0[4]	53·9	32	0	20	9b
2346	42·5	55·1	28	2	0	1222	25·3	48·2	13	0	20	1396	26·7	52·2	15	3	4	10a
2318	41·9	55·3	20	1	8	1550	30·2	51·2	15	2	0	1022	19·4	52·7	11	1	16	10b
2590	46·6	55·5	24	2	20	2076	39·6	52·4	19	0	12	1384	25·7	51·8	15	1	14	11a
3204	57·1	56·1	33	0	16	2008	37·7	53·2	21	3	6	1842	34·6	53·2	19	0	2	11b

[3] Nitrogenous manures omitted.

[4] Nitrogenous manures applied.

Results obtained in the Experiments on

Stackyard Field—

Plot	Manures per acre	1887 Dressed corn Wght.	1887 Dressed corn No. of bush.	1887 Dressed corn Wgt. per bush.	1887 Straw, chaff, &c.	1888 Dressed corn Wght.	1888 Dressed corn No. of bush.	1888 Dressed corn Wgt. per bush.	1888 Straw, chaff, &c.
		lb.		lb.	c. q. lb.	lb.		lb.	c. q. lb.
1	Unmanured	1078	19·9	54·0	11 1 5	923	18·5	49·7	10 3 27
2	Ammonia salts (containing 50 lb. ammonia)	1621	30·3	53·5	15 2 24	2215	42·7	51·9	23 1 26
3	Nitrate of soda (containing nitrogen = 50 lb. ammonia)	1600	30·7	52·1	17 2 20	1928	37·3	51·7	22 1 8
4	[2] Mixed mineral manures (sulphates of potash, soda, and magnesia, with superphosphate)	1140	22·1	51·6	12 2 1	1028	20·1	51·2	10 0 3
5	Mixed mineral manures and ammonia salts (containing 50 lb. ammonia)	1782	33·5	53·1	19 3 6	2419	46·3	52·8	21 1 15
6	Mixed mineral manures and nitrate of soda (containing nitrogen = 50 lb. ammonia)	2353	43·8	53·7	25 2 18	2433	45·4	53·6	25 3 4
7	Unmanured	1082	20·3	53·1	10 2 20	842	16·5	51·1	8 1 4
8a	Mineral manures, and (in alternate years, commencing with 1883) ammonia salts (= 100 lb. ammonia) in addition	2346	43·0	54·5	23 2 20	1858	33·3	51·2	20 0 26
8b	Mineral manures—ammonia salts (= 100 lb. ammonia) yearly to 1882, omitted in 1883 and alternate years	1628	29·6[3]	55·1	15 3 20	2614	53·2[4]	49·7	30 2 22
9a	Mineral manures, and (in alternate years, commencing with 1883) nitrate of soda (containing nitrogen = 100 lb. ammonia) in addition	2846	54·1[4]	52·6	32 2 24	1508	28·2	53·5	14 0 16
9b	Mineral manures—nitrate of soda (= 100 lb. ammonia) yearly to 1882, omitted in 1883 and alternate years	1416	25·8	54·8	12 2 24	2454	49·0[4]	50·0	29 3 26
10a	1877–81, farmyard manure (= 100 lb. ammonia). 1882–88, no manure. 1889, rape cake (= 50 lb. ammonia). 1890–97, no manure.	1368	25·3	54·1	14 0 22	1272	24·7	51·5	14 2 20
10b	1877–87, farmyard manure (= 100 lb. ammonia). 1888, no manure. 1889, rape cake (= 50 lb. ammonia). 1890–97, rape cake (= 100 lb. ammonia)	1344	24·8	54·2	12 1 10	1234	24·3	52·0	14 0 16
11a	1877–81, farmyard manure (= 200 lb. ammonia). 1882–97, no manure.	[illegible]	[illegible]	54·7	18 2 18	1922[5]	36·2[5]	53·1	19 1 12[5]
11b	Farmyard manure (= 200 lb. ammonia) every year	1776	32·3	55·1	17 0 14	1504[6]	28·1[6]	53·5	15 1 14[6]

[1] Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.
[2] Mixed mineral manures are, throughout, [illegible] cwt. superphosphate of lime, 200 lb. sulphate of potash, 100 lb. sulphate of soda, and 100 lb. sulphate of magnesia per acre.
[3] Nitrogenous manures omitted. [4] Nitrogenous manures applied.
[5] Farmyard manure applied in error this year.
[6] Farmyard manure omitted in error this year.

the Continuous Growth of Barley—*continued.*

Produce per acre.

1889						1890						1891						Plot
Dressed corn			Straw, chaff, &c.			Dressed corn			Straw, chaff, &c.			Dressed corn			Straw, chaff, &c.			
Wght.	No. of bush.	Wgt per bush.				Wght.	No. of bush.	Wgt. per bush.				Wght	No. of bush	Wgt. per bush				
lb.		lb.	c.	q.	lb	lb.		lb.	c.	q.	lb.	lb		lb.	c.	q.	lb.	
573	10·8	53·0	6	1	4	1558	29·5	52·8	14	2	2	1050	21·4	49·1	12	1	3	1
1515	28·0	54·0	13	1	6	2126	39·6	53·6	19	1	18	1635	31·9	51·2	16	0	20	2
1425	27·6	51·6	15	0	27	2029	39·2	51·7	21	0	7	1469	29·9	49·0	21	0	11	3
687	13·0	52·7	5	2	25	1736	32·2	54·0	13	3	11	1403	27·7	50·5	13	1	7	4
1778	32·3	54·9	14	1	11	2697	49·2	54·8	22	3	2	2045	39·3	52·0	24	3	11	5
1794	34·6	51·9	21	1	20	2900	52·1	53·7	26	0	17	2198	44·4	49·5	20	3	9	6
667	13·1	50·8	6	2	3	1292	24·6	52·5	12	0	6	988	20·6	47·9	11	0	17	7
2173	41·7[3]	52·0	29	0	12	1856	34·6	53·6	17	3	20	2172	50·2[3]	49·2	35	0	0	8a
1194	21·9	54·5	9	1	2	2814	51·9[3]	54·2	28	2	4	2186	43·1	50·7	22	3	26	8b
1986	39·1[4]	50·7	33	1	14	2274	42·2	53·9	21	1	4	2460	52·6[4]	46·7	38	2	22	9a
958	18·1[3]	53·0	8	3	20	2780	54·6[4]	51·4	31	1	22	1846	36·2[3]	50·9	19	2	6	9b
1120	21·4	52·2	12	3	4	1634	31·1	52·5	14	3	14	1168	23·9	48·9	14	1	0	10a
998	18·8	53·1	10	2	22	2032	39·1	51·9	22	1	8	2430	49·4	49·2	28	1	0	10b
1274	24·1	52·7	12	3	12	1952	36·9	52·9	19	0	12	1596	32·0	49·9	19	1	11	11a
1462	27·2	53·7	13	1	12	2774	51·8	53·5	26	2	18	2084	41·8	49·8	26	2	2	11b

[3] Nitrogenous manures omitted. [4] Nitrogenous manures applied.

Results obtained in the Experiments on

Stackyard Field—

Plot	Manures per acre	1892				1893			
		Dressed corn			Straw, chaff, &c.	Dressed corn			Straw, chaff, &c.
		Wght.	No. of bush.	Wgt. per bush.		Wght.	No. of bush.	Wgt. per bush.	
		lb.		lb.	c. q. lb.	lb.		lb.	c. q. lb.
1	Unmanured	948	19·0	49·9	10 3 19	740	14·0	52·9	8 0 0½
2	[1] Ammonia salts (containing 50 lb. ammonia)	1809	35·6	50·8	16 3 15	770	14·0	53·5	8 2 9
3	Nitrate of soda (containing nitrogen=50 lb. ammonia)	2181	42·8	51·0	23 1 8	1042	19·7	52·9	10 2 19
4	[2] Mixed mineral manures (sulphates of potash, soda, and magnesia, with superphosphate)	1630	32·5	50·1	14 0 14	883	16·7	53·0	9 1 13
5	Mixed mineral manures and ammonia salts (containing 50 lb. ammonia)	2624	49·4	53·1	23 1 7	1062	19·8	53·5	12 0 18
6	Mixed mineral manures and nitrate of soda (containing nitrogen=50 lb. ammonia)	2903	56·1	51·7	31 2 3	1236	23·2	53·2	12 2 21
7	Unmanured	1190	24·4	48·7	12 1 13	736	13·6	54·2	7 1 10
8a	Mineral manures, and (in alternate years, commencing with 1883) ammonia salts (=100 lb. ammonia) in addition	1626	31·1	52·2	15 3 22	1098	20·2[4]	54·2	11 0 16
8b	Mineral manures—ammonia salts (=100 lb. ammonia) yearly to 1882, omitted in 1883 and alternate years	3024	56·3[4]	53·5	28 0 16	1228	22·4[3]	54·9	11 0 22
9a	Mineral manures and (in alternate years, commencing with 1883) nitrate of soda (containing nitrogen = 100 lb. ammonia) in addition	1908	35·6[3]	52·5	19 1 8	1456	26·0[4]	54·2	15 0 4
9b	Mineral manures—nitrate of soda (=100 lb. ammonia) yearly to 1882, omitted in 1883 and alternate years	3102	60·1[4]	51·4	36 0 18	1166	21·2[3]	54·9	11 3 26
10a	1877–81, farmyard manure (=100 lb. ammonia); 1882–88, no manure; 1889, rape cake (= 50 lb. ammonia); 1890–97, no manure	1318	26·5	49·7	14 0 4	886	16·2	54·5	8 3 12
10b	1877–87, farmyard manure (=100 lb. ammonia); 1888, no manure; 1889, rape cake (=50 lb. ammonia); 1890–97, rape cake (=100 lb. ammonia)	2502	48·8	51·3	23 3 14	1168	21·4	54·5	11 3 0
11a	1877–81, farmyard manure (=200 lb. ammonia); 1882–97, no manure	1670	32·8	50·9	17 3 14	1260	23·2	54·4	12 3 8
11b	Farmyard manure (=200 lb. ammonia) every year	2868	54·4	52·7	28 3 10	1716	31·5	54·5	16 3 4

[1] Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.

[2] Mixed mineral manures are, throughout, 3½ cwt. superphosphate of lime, 200 lb. sulphate of potash, 100 lb. sulphate of soda, and 100 lb. sulphate of magnesia per acre.

[3] Nitrogenous manures omitted.

[4] Nitrogenous manures applied.

the CONTINUOUS GROWTH OF BARLEY—*continued.*

Produce per acre.

1894				1895				1896				1897					Plot
Dressed corn			Straw, chaff, &c.	Dressed corn			Straw, chaff, &c.	Dressed corn			Straw, chaff, &c.	Head corn			Tail corn	Straw, chaff, &c.	
Weight	No. of bush.	Wgt. per bush.		Weight	No. of bush.	Wgt. per bush.		Weight	No. of bush.	Wgt. per bush.		Weight	No. of bush.	Wgt. per bush.	Weight		
lb.		lb.	c. q. lb.	lb.		lb.	c. q. lb.	lb.		lb.	c. q. lb.	lb.		lb.	lb.	c. q. lb.	
947	18·5	51·1	11 2 3	415	8·3	49·6	5 1 17	520	10·3	50·5	7 3 13	289	5·6	51·7	11	4 2 11	1
1466	28·7	51·1	14 1 25	741	14·7	50·3	7 0 15	580	12·0	48·4	9 2 12	461	9·1	50·7	30	7 3 16	2
2160	42·1	51·3	23 3 9	929	18·7	49·7	9 3 20	1043	20·6	50·5	13 3 9	1070	21·0	50·9	54	15 0 18	3
1255	23·7	51·7	10 1 7	781	15·4	50·6	8 0 2	702	13·7	51·3	9 3 11	534	10·2	52·1	25	7 1 18	4
2608	48·0	54·3	25 1 18	842	16·3	51·5	8 3 7	839	16·6	50·4	12 3 0	631	11·9	53·0	31	10 1 3	5
2616	49·4	52·9	33 2 22	1616	31·5	51·3	16 1 11	1611	30·1	53·4	21 3 23	1732	32·2	53·8	57	22 2 2	6
1163	22·6	51·5	11 1 14	709	14·1	50·4	7 0 14	574	11·2	51·1	9 0 0	361	6·9	52·5	27	4 2 15	7
1804	33·9–	53·2	19 1 6	622	11·8[4]	52·5	6 1 26	486	9·6[3]	50·7	8 0 18	640	11·8[4]	54·2	32	8 1 18	8a
2576	50·6[4]	50·9	36 0 20	930	18·0[3]	51·7	12 0 24	920	18·4[4]	49·9	12 3 16	564	10·4–	54·2	46	8 3 14	8b
2094	39·8[3]	52 5	21 0 2	1676	32·0[4]	52·4	16 3 10	1301	24·8[3]	52·7	17 3 20	1860	34·9[4]	53·2	122	24 1 20	9a
2606	51·8[4]	50·3	45 0 20	1166	22·3[3]	52·2	13 0 16	1752	33·3[4]	52·6	22 2 24	1010	18·5[4]	54·6	44	12 1 10	9b
1446	27·7	52·2	13 3 0	1030	20·4	50·5	10 2 2	744	14·4	51·7	10 3 20	474	9·0	52·7	72	6 1 0	10a
2604	49·4	52·7	29 0 20	1562	30·5	51·2	15 0 8	1204	23·5	51·2	18 1 16	1256	23·9	52·6	118	17 3 14	10b
1908	35·7	53·5	20 1 4	1372	26·8	51·2	14 2 10	1112	22·1	50·4	15 1 8	894	18·2	52·7	86	9 3 16	11a
2806	52·4	53·5	29 2 2	1778	34·4	51·6	17 2 26	1770	33·5	52·8	24 2 16	1500	27·8	54·0	124	18 1 16	11b

[3] Nitrogenous manures omitted. [4] Nitrogenous manures applied.

SUMMARY OF
CONTINUOUS BARLEY
Stackyard Field—
Area 2¼ acres. Plots ¼ acre

Plot	Manures (applied annually) per acre	Average of first 10 years 1877–86					Average of second 10 years—1887–96				
		Bush. of corn	Wgt. of corn per bush.	Weight of straw, chaff, &c.			Bush. of corn	Wgt. of corn per bush.	Weight of straw, chaff, &c.		
			lb.	c.	q.	lb.		lb.	c.	q.	lb.
1	Unmanured	26·9	51·6	15	2	11	17·0	51·2	9	3	17
2	[1] Ammonia salts (=50 lb. ammonia)	39·4	52·0	23	0	11	27·7	51·8	14	2	20
3	Nitrate of soda (=50 lb. ammonia).	40·4	51·7	25	0	11	30·9	51·1	17	3	16
4	[2] Mixed mineral manures (superphosphate, sulphates of potash, soda, and magnesia) . .	23·3	51·8	13	2	0	21·7	51·7	10	2	23
5	Mixed mineral manures and ammonia salts (=50 lb. ammonia)	43·0	53·1	26	0	11	35·1	53·0	18	3	12
6	Mixed mineral manures and nitrate of soda (=50 lb. ammonia)	46·0	53·0	30	0	14	41·1	52·5	24	2	12
7	Unmanured	23·0	51·0	13	2	14	18·1	51·1	9	2	10
8a	Mineral manures and (in alternate years) ammonia salts (=100 lb. ammonia)	51·2	52·9	33	2	0	39·7	52·1	24	0	21
8b	Mineral manures—ammonia salts being omitted in alternate years	37·0[3]	53·6[3]	21	0	14[3]	28·0	52·8	15	1	7
9a	Mineral manures and (in alternate years) nitrate of soda (=100 lb. ammonia)	53·3	52·4	38	1	0	45·3	51·2	30	0	24
9b	Mineral manures—nitrate of soda being omitted in alternate years	34·5[3]	53·8[3]	18	1	0	29·4	53·1	16	0	0
10a	No manure, 1882–88, after farmyard manure (=100 lb. ammonia) yearly, 1877–81 . . .	31·1	52·3	17	2	14	—	—	—		
	No manure, 1890–96, after rape cake (=50 lb. ammonia) one year, 1889, and farmyard manure yearly, 1877–81, as above .	—	—	—			22·9	51·4	12	1	23
10b	Farmyard manure (=100 lb. ammonia) applied every year, 1877–1887	30·5	52·2	17	1	2	—	—	—		
	Rape cake (=100 lb. ammonia) applied every year, 1890–96 .	—	—	—			37·4	51·7	21	1	1
11a	No manure, 1882–96, after farmyard manure (=200 lb. ammonia) yearly, 1877–81)	37·6[3]	53·1[3]	21	0	12[3]	29·9	52·3	16	3	1
11b	Farmyard manure (=200 lb. ammonia) applied every year .	40·0	53·2	23	1	0	39·9	53·1	22	1	12

[1] Ammonia salts are equal weights of sulphate of ammonia and muriate of ammonia.
[2] Mineral manures are, throughout, 3½ cwt. superphosphate of lime, 200 lb. sulphate of potash, 100 lb. sulphate of soda, 100 lb. sulphate of magnesia per acre.
[3] Average of five years only (1882–86).

RESULTS.

EXPERIMENTS.

Produce per acre.

each. Commenced 1877.

Average of 20 years—1877–96								Plot
Highest yield of corn	Lowest yield of corn	Mean of highest and lowest yields of corn	General mean yield of corn	Weight of corn per bushel	Weight of straw, chaff, &c.			
bush.	bush.	bush.	bush.	lb.	c.	q.	lb.	
34·1	8·3	21·2	21·9	51·5	12	3	2	1
51·2	12·0	31·6	[illegible]	51·9	18	3	17	2
51·6	18·7	35·1	35·6	51·4	21	2	1	3
33·6	11·8	22·7	22·5	51·7	12	0	11	4
51·9	16·3	34·1	39·0	53·2	22	1	27	5
57·8	23·2	40·5	43·5	52·7	27	1	13	6
33·3	11·2	22·2	20·5	51·0	11	2	12	7
62·5	11·7	37·1	45·4	52·5	28	3	10	8a
46·4	9·6	28·0	31·6*	5[illegible]·1*	17	1	6*	8b
66·8	26·9	46·8	49·3	51·8	34	0	26	9a
42·2	18·1	30·1	31·1*	53·[illegible]*	16	3	0*	9b
—	—	—	—	—		—		10a
—	—	—	—	—		—		
—	—	—	—	—		—		10b
—	—	—	—	—		—		
46·6	22·1	34·3	32·6*	52·7*	18	1	7*	11a
57·1	26·5	41·8	39·9	53·1	22	3	9	11b

* Average of fifteen years only (1882–96).

C. *Results obtained in the Rotation Experiments—Stackyard Field.*

1. ROTATION ROOTS—1877-1884.

STACKYARD FIELD—PRODUCE PER ACRE.

Plot	Manures per acre	Mangels, 1877–1881										Swedes, 1882–1884					
		1877		1878		1879		1880		1881		1882		1883		1884	
		Roots	Leaves	Roots	Leaves	Roots	Leaves	Roots	Leaves	Roots	Leaves	Roots	Leaves	Roots	Leaves	Roots	Leaves
		t. c.	t. c.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
1	With dung made by the consumption of 1,000 lb. decorticated cotton cake, together with 1,880 lb. straw as litter, 5,000 lb. mangels, and 1,250 lb. wheat straw chaff .	3 17	2 15	13 2 1 0	2 15 1 0	4 10 1 8	2 2 1 11	19 10 2 20	3 15 3 20	22 5 0 23	3 12 2 21	17 6 2 1	2 4 1 23	20 0 1 27	3 3 1 8	11 9 3 16	1 18 0 27
2	With dung made by the consumption of 1,000 lb. maize meal, together with 1,880 lb. straw as litter, 5,000 lb. mangels, and 1,250 lb. wheat straw chaff	2 1¼	1 16¼	11 16 0 0	2 15 0 21	4 9 3 18	2 1 0 17	18 19 3 6	3 6 2 16	21 14 0 17	3 12 0 15	17 1 2 7	3 4 0 3	20 1 0 12	3 19 3 14	13 13 0 6	1 16 1 9
3	With dung made by the consumption of 5,000 lb. mangels, and 1,250 lb. wheat straw chaff, together with 1,880 lb. straw as litter, without cake or corn; and with artificial manure containing two-thirds as much nitrogen, and the other constituents of the manure from 1,000 lb. *decorticated cotton cake*	7 4¾	3 8¼	18 13 0 20	3 13 3 0	7 19 0 26	2 19 1 8	24 10 1 25	3 15 2 6	24 7 0 18	4 0 3 25	19 13 1 7	2 9 0 3	23 6 3 21	3 1 1 0	16 10 1 0	2 17 3 2
4	With dung made by the consumption of 5,000 mangels, and 1,250 lb. wheat straw chaff, together with 1,880 lb. straw as litter, without cake or corn; and with artificial manure containing as much nitrogen, and the other constituents of the manure from 1,000 lb. maize meal . . .	3 16½	2 11½	12 15 1 12	3 3 3 5	5 15 3 22	2 3 3 0	20 18 1 13	3 6 2 20	21 18 2 0	3 16 0 6	18 3 1 6	2 6 0 18	20 13 1 4	3 16 2 8	15 14 2 9	2 16 3 10

Rotation Roots—1885–88.

Stackyard Field—Produce per acre.

Plot	Manures per acre	1885		1886		1887		1888	
		Swedes.							
		Roots	Leaves	Roots	Leaves	Roots	Leaves	Roots	Leaves
		t. c. q. lb	t. c. q. lb.	t. c. q lb.	t. c. q. lb	t. c. q. lb.	t. c. q. lb.	t c. q. lb	t. c. q. lb
1	3 cwt. superphosphate (after wheat—cotton cake plot)	17 0 2 22	1 13 3 12	4 15 0 20	Very much blighted and therefore not weighed	10 18 1 20	1 3 0 14	8 9 0 16	1 7 2 16
2	3 cwt. superphosphate (after wheat—maize meal plot)	17 0 0 16	1 16 2 14	8 15 2 4		9 17 3 20	0 16 1 12	8 19 2 16	1 8 2 10
3	3 cwt. superphosphate (after wheat—artificial equivalent of cotton cake dung plot)	14 7 2 4	1 16 2 18	7 15 2 20		11 0 0 4	1 4 2 20	9 13 2 20	1 6 3 12
4	3 cwt. superphosphate (after wheat—artificial equivalent of maize meal dung plot)	13 15 2 20	1 17 0 2	7 9 1 16		8 19 3 8	0 19 2 1	9 2 2 14	1 5 0 18
		Mangels.				(Swedes.[1])			
5	No manure (after wheat—cotton cake plot) . .	11 6 0 12	1 16 0 24	17 8 1 2	3 6 3 24	10 14 0 8[1]	1 8 0 22[1]	8 8 3 12	3 7 1 18
6	No manure (after wheat—maize meal plot) . .	11 1 0 24	1 18 3 20	19 1 1 20	3 10 3 24	9 17 1 12[1]	0 18 1 8[1]	7 17 3 21	3 6 1 14
7	No manure (after wheat—artificial equivalent of cotton cake dung plot) .	13 1 0 20	1 16 3 24	19 18 3 11	3 4 1 10	9 14 1 4[1]	0 17 2 0[1]	9 17 0 8	3 8 3 12
8	No manure (after wheat—artificial equivalent of maize meal dung plot) .	10 16 2 8	2 3 1 8	18 13 2 14	3 9 1 4	8 8 3 14[1]	0 17 2 16[1]	8 9 0 20	3 2 2 12

[1] In 1887 swedes were grown (with 3 cwt. superphosphate per acre) instead of mangels on plots 5–8.

Results obtained in the Rotation Experiments—continued.

Rotation Roots—1889–92.

Stackyard Field—Produce per acre.

Plot	Manures per acre	1889 Roots	1889 Leaves	1890 Roots	1890 Leaves	1891 Roots	1891 Leaves	1892 Roots	1892 Leaves
		t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
		Swedes.							
1	3 cwt. superphosphate (after wheat—cotton cake plot) .	12 8 0 16	2 0 3 18	No crop	No crop	10 8 0 26	2 12 1 10	1 6 3 18	Not weighed
2	3 cwt. superphosphate (after wheat—maize meal plot) .	12 5 2 26	2 2 3 18			9 15 3 20	2 11 3 0	1 6 0 0	
3	3 cwt. superphosphate (after wheat—artificial equivalent of cotton cake dung plot)	10 4 0 18	1 15 0 24			8 17 2 16	2 12 0 0	1 7 1 2	
4	3 cwt. superphosphate (after wheat—artificial equivalent of maize meal dung plot)	10 17 0 14	1 17 0 8			8 11 0 0	2 9 0 10	1 15 1 8	
		Mangels.							
5	No manure (after wheat—cotton cake plot) . .	15 7 2 4	4 4 2 4	10 6 0 4	3 18 3 6	9 1 3 21	2 6 0 0	10 1 2 4	2 16 2 10
6	No manure (after wheat—maize meal plot) . .	13 8 1 10	4 0 2 18	13 12 2 16	4 14 2 8	8 10 0 8	2 4 3 10	10 16 1 6	3 5 3 11
7	No manure (after wheat—artificial equivalent of cotton cake dung plot) .	12 4 0 8	3 11 1 20	14 8 3 24	4 13 0 2	7 13 1 20	2 5 1 18	11 16 3 6	2 15 1 11
8	No manure (after wheat—artificial equivalent of maize meal dung plot) .	11 13 0 8	3 2 2 18	12 10 3 10	4 2 0 8	7 13 0 14	2 4 3 0	11 6 3 8	2 19 2 21

Rotation Roots—1893-96.

Stackyard Field—Produce per acre.

Plot	Manures per acre	1893 Roots	1893 Leaves	1894 Roots	1894 Leaves	1895 Roots	1895 Leaves	1896 Roots	1896 Leaves
		t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c q. lb.	t. c q. lb	t. c. q. lb.
		Swedes.							
1	3 cwt. superphosphate (after wheat—cotton cake plot)	6 12 0 0	1 2 1 8	8 6 3 18	1 4 0 14	8 9 2 4	2 0 1 24	11 12 2 20	1 16 0 14
2	3 cwt. superphosphate (after wheat—maize meal plot)	6 8 3 12	1 2 0 18	9 19 1 16	1 10 0 26	8 13 3 24	1 19 1 12	11 9 2 0	2 3 1 24
3	3 cwt. superphosphate (after wheat—artificial equivalent of cotton cake dung plot)	8 10 2 12	1 3 2 0	10 10 0 20	1 6 2 14	8 4 3 4	1 18 2 16	13 5 0 14	2 0 1 8
4	3 cwt. superphosphate (after wheat—artificial equivalent of maize meal dung plot)	8 14 0 16	1 3 1 0	9 14 2 14	1 5 0 14	7 16 4 4	1 17 1 14	12 14 1 21	2 0 0 4
		Mangels.							
5	No manure (after wheat—cotton cake plot)	10 2 3 14	3 11 3 14	7 13 3 0	2 9 1 0	9 5 3 20	2 11 2 0	14 4 0 22	2 17 3 20
6	No manure (after wheat—maize meal plot)	11 0 0 14	3 11 3 22	8 11 0 22	2 15 3 14	10 13 1 4	2 16 1 0	12 19 2 10	3 7 0 11
7	No manure (after wheat—artificial equivalent of cotton cake dung plot)	10 14 0 0	3 7 1 14	8 0 2 0	2 8 3 0	10 2 3 16	2 11 1 0	13 13 2 20	3 8 1 0
8	No manure (after wheat—artificial equivalent of maize meal dung plot)	8 16 3 0	3 3 2 0	8 12 1 14	2 11 0 0	10 3 2 0	2 7 3 21	12 2 1 0	2 19 3 14

Results obtained in the Rotation Experiments—continued.

ROTATION ROOTS—1897.

Stackyard Field—Produce per acre.

Plot	Manures per acre	Roots t.	Roots c.	Roots q.	Roots lb	Leaves t	Leaves c	Leaves q.	Leaves lb.
	SWEDES								
1	3 cwt. superphosphate (after wheat—cotton cake plot)	12	16	0	0	1	9	3	10
2	3 cwt. superphosphate (after wheat—maize meal plot)	14	0	0	12	1	16	0	10
3	3 cwt. superphosphate (after wheat—artificial equivalent of cotton cake dung plot)	15	8	2	14	1	10	2	0
4	3 cwt. superphosphate (after wheat—artificial equivalent of maize meal dung plot)	14	10	0	14	2	0	3	0
	MANGELS								
5	No manure (after wheat—cotton cake plot)	5	2	1	20	2	3	1	0
6	No manure (after wheat—maize meal plot)	2	15	0	0	1	13	1	14
7	No manure (after wheat—artificial equivalent of cotton cake dung plot)	2	9	0	0	0	18	1	24
8	No manure (after wheat—artificial equivalent of maize meal dung plot)	2	4	2	0	1	1	0	0

2. Rotation Seeds—1877-84 (Clover).[1]

Stackyard Field—Increase in Live Weight of Sheep feeding off Clover.

Plot	Per acre	1877	1878	1879	1880	1881	1882	1883	1884
		lb.	lb	lb.	lb	lb	lb	lb.	lb
1	Fed off by 10 sheep with 728 lb decorticated cotton cake . .	303	447	328	$261\frac{3}{4}$	$433\frac{3}{4}$	$341\frac{1}{2}$	$266\frac{1}{4}$	517
2	Fed off by 10 sheep with 728 lb. maize meal	275	$443\frac{1}{2}$	435	$316\frac{1}{4}$	$351\frac{1}{4}$	$401\frac{1}{4}$	$210\frac{1}{4}$	$416\frac{1}{2}$
3	Fed off by 10 sheep without purchased food	214	$391\frac{1}{4}$	$313\frac{1}{2}$	$219\frac{1}{3}$	$133\frac{1}{2}$	$198\frac{1}{4}$	$91\frac{1}{2}$	$423\frac{1}{4}$
4	Fed off by 10 sheep without purchased food	$209\frac{1}{2}$	$325\frac{1}{4}$	250	$313\frac{1}{2}$	$167\frac{3}{4}$	$115\frac{1}{4}$	$189\frac{1}{4}$	$433\frac{1}{4}$

Rotation Seeds—1885 87 (Tares and Peas).

Stackyard Field—Produce per acre.

Plot	Manures per acre		1885	1886 Weight	No. of bush.	Wght per bush.	Straw, &c.	1887 Weight	No. of bush	Weight per bushel	Straw, &c.
				c q lb		lb.	c q. lb	c. q lb		lb	c q lb
1	No manure (after barley—cotton cake plot)	Tares	No crop	25 1 23	45 5	62·7	30 3 15	11 3 22	20 9	63 85	19 2 $9\frac{1}{2}$
2	No manure (after barley—maize meal plot)	Tares	No crop	27 2 $19\frac{1}{2}$	48 8	63 5	26 2 $16\frac{1}{2}$	11 2 $5\frac{1}{3}$	20 1	64 52	15 3 $25\frac{1}{2}$
3	No manure (after barley—artificial equivalent of cotton cake dung plot .	Tares	No crop	28 0 $21\frac{1}{2}$	49 2	64 2	27 1 $6\frac{1}{2}$	10 0 1	17·2	65 06	14 0 26
4	No manure (after barley—artificial equivalent of maize meal dung plot . .)	Tares	No crop	26 1 9	46 2	63 8	24 1 $1\frac{1}{2}$	9 0 9	15 8	64 21	13 0 5
5	No manure (after barley—cotton cake plot)	Peas	No crop	24 0 6	42 3	63 7	21 3 $0\frac{1}{2}$	20 0 0	34 6	64 80	17 1 15
6	No manure (after barley—maize meal plot)	Peas	No crop	21 3 20	37 9	64 8	17 1 $19\frac{1}{2}$	17 1 7	29 8	65 07	14 1 3
7	No manure (after barley—artificial equivalent of cotton cake dung plot) . .	Peas	No crop	26 0 13	45 3	64 5	21 0 $27\frac{1}{2}$	13 3 $16\frac{1}{2}$	21 2	64 31	13 1 $4\frac{1}{2}$
8	No manure (after barley—artificial equivalent of maize meal dung plot) . .	Peas	No crop	25 3 27	45 8	63 6	20 2 $0\frac{1}{2}$	9 1 0	16 1	64 44	15 3 11

[1] The natural position of the Tables on this and the two succeeding pages would have been after the Barley Tables, which begin on p. 708; it is for convenience of pagination that they are introduced here.—Ed.

Results obtained in the Rotation Experiments – continued.

ROTATION SEEDS—1888–1895.

Stackyard Field—Produce per acre.

Plot	Manure per acre	Green clover[1] 1888 t. c. q. lb.	Clover hay 1889 t. c. q. lb.	Clover hay 1890 t. c. q. lb.	Clover hay 1891 t. c. q. lb.	Clover hay 1892 t. c. q. lb.	Clover hay 1893 t. c. q. lb.	Clover hay 1894 t. c. q. lb.	Clover hay 1895 t. c. q. lb.
1	No manure (after barley—cotton cake plot)	6 4 0 0	4 1 0 18	2 17 0 1	3 8 3 26	1 13 1 26	0 12 3 8	2 9 1 0	1 11 3 6
2	No manure (after barley—maize meal plot)	7 8 3 10	1 6 0 14	3 0 0 24	3 13 2 2	1 13 1 2	0 14 2 0	2 4 0 16	1 11 3 26
3	No manure (after barley—artificial equivalent of cotton cake dung plot)	8 7 1 12	1 2 2 10	3 6 1 14	3 14 1 20	1 13 1 6	0 15 2 2	2 14 0 0	1 12 0 0
4	No manure (after barley—artificial equivalent of maize meal dung plot)	6 14 2 2	4 1 2 14	3 13 3 22	3 17 3 26	1 8 3 18	0 17 1 0	2 1 2 14	1 11 1 0
5	No manure (after barley cotton cake plot)	4 11 2 12	3 17 2 18	2 19 1 2	3 12 3 2	1 5 3 8	0 11 1 22	1 1 2 20	0 19 1 14
6	No manure (after barley—maize meal dung plot)	4 14 2 8	3 16 1 4	3 7 0 2	3 18 3 8	1 10 3 24	0 14 2 16	1 5 3 4	1 8 2 24
7	No manure (after barley—artificial equivalent of cotton cake dung plot)	3 11 3 24	4 2 1 14	3 16 3 12	4 1 1 14	1 5 3 22	0 12 2 6	1 8 3 24	1 2 2 22
8	No manure (after barley—artificial equivalent of maize meal dung plot)	2 10 2 20	3 17 2 0	3 19 2 22	3 15 1 6	1 4 2 22	0 15 1 16	1 0 3 6	1 6 3 26

[1] The clover was this year (1888) weighed green.

ROTATION SEEDS—1896–1897.

Stackyard Field—Produce per acre.

Plot	Manures per acre	1896 Peas: Head corn, Weight	1896 Peas: Head corn, Bushels	1896 Peas: Head corn, Weight per bushel	1896 Peas: Tail corn, Weight	1896 Peas: Tail corn, Bushel	1896 Peas: Tail corn, Weight per bushel	1896 Peas: Straw, &c.	1897 Clover: Weight of hay
		c. q. lb.		lb.	c. q. lb.		lb.	c. q. lb.	t. c. q. lb.
1	No manure (after barley—cotton cake plot)	15 3 9½	28·86	61·15	0 1 1½	0·6	50	20 0 5	0 9 3 20
2	No manure (after barley—maize meal plot)	16 0 20½	28·96	62·59	0 0 17	0·4	38	20 3 8	0 9 2 14
3	No manure (after barley—artificial equivalent of cotton cake dung plot)	16 2 2	29·14	62·84	0 0 21½	0·5	40	22 2 15½	0 11 2 0
4	No manure (after barley—artificial equivalent of maize meal dung plot)	15 3 6	28·15	62·87	0 0 20½	0·5	42	19 1 21	0 10 2 18
5	No manure (after barley—cotton cake plot)	12 1 0½	21·73	63·15	0 0 18	0·3	38	13 2 15½	0 7 0 14
6	No manure (after barley—maize meal plot)	15 0 20	26·96	63·06	0 0 15½	0·4	40	17 1 0	0 5 3 8
7	No manure (after barley—artificial equivalent of cotton cake dung plot)	13 0 14½	23·37	62·91	0 0 20½	0·5	42	15 2 27	0 8 2 21
8	No manure (after barley—artificial equivalent of maize meal dung plot)	11 3 22	21·15	62·37	0 0 20½	0·6	36	15 2 16	0 7 1 12

Results obtained in the Rotation Experiments—continued.

3. Rotation Barley, 1878–1885.

Stackyard Field—Produce per acre.

Plot	Year	Manures per acre (After roots fed off)	Head corn: Weight c.	q.	lb.	Head corn: Bushels	Head corn: Weight per bushel lb.	Tail corn: Weight c.	q.	lb.	Tail corn: Bush.	Tail corn: Wght. per bushel lb.	Straw, chaff, &c. c.	q.	lb.
1	1878	Without artificials (cotton cake plot) . . .	18	1	9	37·2	55·2	1	2	23½	4·1	46·5	28	3	7
	1879	,, ,, ,, . . .	17	2	4	38·0	51·8	0	0	27¼	—	—	27	0	16
	1880	,, ,, ,, . . .	19	0	21	41·3	52·0	0	0	26	—	—	25	1	17
	1881	,, ,, ,, . . .	20	3	1¼	46·5	50·0	1	3	5	4·1	47·5	28	0	7
	1882	,, ,, ,, . . .	22	0	10½	47·6	51·9	1	2	1½	3·7	45·1	34	0	24
	1883	,, ,, ,, . . .	24	3	9	50·8	54·7	1	2	2½	3·6	46·5	34	0	12½
	1884	,, ,, ,, . . .	24	0	22	48·8	55·5	0	2	13	1·6	42·5	28	0	13
	1885	,, ,, ,, . . .	28	3	1¼	60·3	53·4	0	3	3¾	2·1	41·7	38	2	23
2	1878	Without artificials (maize meal plot) . . .	17	3	16¾	36·7	54·5	0	3	13	2·1	46·5	29	0	15
	1879	,, ,, ,, . . .	18	3	13½	40·6	52·0	0	0	23½	—	—	29	1	5
	1880	,, ,, ,, . . .	16	2	24	35·7	52·5	0	1	18	1·2	37·0	24	1	23
	1881	,, ,, ,, . . .	20	3	6	46·0	50·6	0	2	4½	1·3	44·7	26	3	27
	1882	,, ,, ,, . . .	20	3	19	44·5	52·7	1	1	11	3·6	44·4	33	3	27
	1883	,, ,, ,, . . .	28	1	16	58·0	54·8	0	3	8¾	2·0	46·3	35	1	13
	1884	,, ,, ,, . . .	24	0	3½	48·1	55·9	0	3	6	2·0	44·2	27	3	26
	1885	,, ,, ,, . . .	27	1	20	57·1	53·8	0	2	3¾	1·5	39·7	36	3	22¾

3	1878	With artificial manure containing one third as much nitrogen as the manure from 1,000 lb. cotton cake	24 0 15¾	49·6	54·5	0 3 0	1·8	46·0	35 2 25
	1879	" " " . .	18 2 23¾	40·3	52·0	2 0 11¼	5·1	43·5	28 3 7
	1880	" " " . .	18 2 23½	41·0	51·0	0 0 23¼	--	—	27 1 11
	1881	" " " . .	20 3 17	46·8	50·0	1 3 0	4·2	47·0	29 0 8
	1882	" " " . .	19 3 5	42·6	52·0	1 3 7	4·0	44·3	36 1 4
	1883	" " " . .	27 1 22	57·0	53·9	1 1 8½	3·5	41·8	41 2 1
	1884	" " " . .	24 3 20	50·9	54·8	1 0 21	2·9	45·8	36 1 16
	1885	" " " . .	29 1 4¾	61·2	53·6	0 3 23¾	2·5	43·6	45 3 24
4	1878	Without artificial manure (artificial equivalent of maize meal dung plot)	16 0 22	33·3	54·5	1 1 3	3·1	46·5	29 1 20
	1879	" " " . . .	14 3 11¾	31·4	53·0	0 2 3	1·4	40·5	23 2 24
	1880	" " " . . .	15 2 2	33·4	52·0	0 0 22½	--	—	22 1 5
	1881	" " " . . .	21 1 17¾	47·5	50·5	1 1 22¾	3·5	17·0	25 3 2
	1882	" " " . . .	20 0 25	43·3	52·3	1 0 22	3·0	41·3	33 2 13
	1883	" " " . . .	25 2 11	52·8	54·3	2 0 13	5·0	47·1	12 1 4
	1884	" " " . . .	22 2 15	46·1	54·9	0 2 11	1·4	49·5	28 0 19
	1885	" " " . . .	28 0 3¼	58·3	53·8	0 2 12¾	1·6	41·7	39 3 3¼

Results obtained in the Rotation Experiments—continued.

Rotation Barley—1886–1897.

Stackyard Field—Produce per acre.

Plot	Year	Manures per acre	Head corn Weight c.	q.	lb.	Bushels	Weight per bushel lb.	Tail corn Weight c.	q.	lb.	Bush.	Wght. per bushel lb.	Straw, chaff, &c. c.	q.	lb.
1	1886	After swedes fed off with 400 lb. decort. cotton cake	22	3	1	46·6	54·7	1	1	27	3·5	48·0	25	0	21
	1887	" " "	20	2	2½	41·1	55·5	1	2	11½	3·8	49·0	28	2	20
	1888	" " "	17	2	6	36·0	54·6	2	0	3½	5·1	44·7	24	0	12½
	1889	" " "	14	3	11½	27·6	60·2	0	2	6½	1·4	46·0	19	1	10
	1890	" " "	21	0	20	43·4	54·6	0	1	26	1·1	50·0	23	3	14½
	1891	" " "	19	3	11½	41·3	49·9	2	1	5½	6·7	38·4	31	2	3½
	1892	" " "	17	1	0½	35·7	54·1	0	0	26	1·0	27·0	20	0	14
	1893	" " "	13	3	7	28·6	54·1	0	1	19	0·9	52·0	14	1	4
	1894	" " "	22	0	26	48·7	51·1	0	1	24½	1·3	32·0	28	2	4
	1895	" " "	17	2	26	37·6	52·8	0	1	0½	1·1	25·0	16	3	18
	1896	" " "	11	1	5½	24·5	51·6	0	1	9	1·4	27·0	18	1	10
	1897	" " "	8	2	9½	18·7	51·4	1	1	10½	3·8	40·0	15	2	15½
2	1886	After swedes fed off with 400 lb. maize meal . .	19	3	8	39·8	55·6	1	0	11	2·6	47·5	19	2	17
	1887	" " . .	19	3	1	40·2	55·1	1	1	22	3·3	48·5	32	1	19½
	1888	" " . .	16	1	22	33·6	54·8	1	1	3½	3·4	42·7	21	3	5½
	1889	" " . .	14	2	6	29·8	54·7	0	1	2	0·7	45·0	17	0	16
	1890	" " . .	19	2	0½	39·7	55·1	0	1	8	0·8	48·0	20	3	18
	1891	" " . .	19	2	21	43·9	50·3	1	1	26½	4·3	38·5	27	1	7
	1892	" " . .	14	1	2	29·9	53·4	0	1	1½	0·9	34·0	15	0	7
	1893	" " . .	13	0	12	27·3	53·7	0	1	18	1·0	46·0	12	0	22
	1894	" " . .	20	2	10	43·3	53·1	0	1	16	1·2	38·0	26	0	27
	1895	" " . .	15	2	25	33·0	53·3	0	0	13	—	—	17	1	10
	1896	" " . .	9	3	12½	21·3	51·8	0	1	12	1·4	29·0	15	0	14
	1897	" " . .	8	2	7½	18·0	53·2	1	0	13½	3·0	41·5	11	0	16

3	1886	After swedes fed off, and artificial equivalent of cotton cake dung	22	3	8	45·9	55·7	2	0	19½	4·8	50·1	26	1	11
	1887	" " " . .	22	3	7	46·6	54·8	1	1	25	3·4	49·0	37	1	22
	1888	" " " . .	19	1	10½	39·8	54·4	2	0	2	5·2	43·7	26	3	11½
	1889	" " " . .	17	3	22	37·6	53·5	0	2	14½	1·6	44·0	25	2	14
	1890	" " " . .	21	1	16½	43·8	54·8	0	1	8½	0·8	48·0	25	0	0½
	1891	" " " . .	20	0	24½	45·5	49·7	2	2	12	7·2	40·2	31	3	9½
	1892	" " " . .	23	0	3½	48·2	53·5	0	1	12½	1·3	31·0	21	2	14½
	1893	" " " . .	14	3	24½	30·7	51·7	0	1	20	0·9	52·0	14	1	22½
	1894	" " " . .	21	3	26½	46·9	52·5	0	1	14	1·2	36·0	28	1	26
	1895	" " " . .	16	2	21½	34·7	53·9	0	0	18	—	—	17	0	16½
	1896	" " " . .	12	0	18	26·7	50·98	0	1	16	1·4	31·0	17	3	26
	1897	" " " . .	12	1	8	26·0	53·1	1	3	25½	5·2	42·8	22	0	11
4	1886	After swedes fed off, and artificial equivalent of maize meal dung	19	2	26	39·4	56·0	0	3	11½	2·0	47·7	18	0	24½
	1887	" " " . .	21	2	20	44·2	54·9	1	0	24½	2·9	46·5	31	0	13½
	1888	" " " . .	15	2	3	31·9	54·6	1	3	26	4·8	46·0	23	3	13
	1889	" " " . .	16	3	15	34·6	54·6	0	1	4	0·7	45·5	21	1	15
	1890	" " " . .	17	2	6	35·8	54·8	0	0	26	0·6	46·0	18	3	5½
	1891	" " " . .	19	2	1½	43·8	49·8	0	3	12	2·5	38·1	28	3	3
	1892	" " " . .	12	0	19½	25·8	52·8	0	1	4½	0·9	31·0	18	2	10½
	1893	" " " . .	13	2	22	28·8	53·3	0	1	13	0·8	48·0	15	0	22
	1894	" " " . .	20	1	22	42·6	53·7	0	1	13½	1·1	36·0	22	2	21
	1895	" " " . .	14	2	27	31·3	52·8	0	0	15	—	—	17	2	1
	1896	" " " . .	9	2	8½	20·9	51·2	0	1	7½	1·2	29·0	16	0	1
	1897	" " " . .	11	0	17	23·2	53·9	1	0	7½	2·9	41·7	16	2	14½

Results obtained in the Rotation Experiments—continued.

ROTATION BARLEY—1886–97—*continued.*

Stackyard Field—Produce per acre.

Plot	Year	Manures per acre	Head corn: Weight c.	Head corn: Weight q.	Head corn: Weight lb.	Head corn: Bushels	Head corn: Weight per bushel lb.	Tail corn: Weight c.	Tail corn: Weight q.	Tail corn: Weight lb.	Tail corn: Bush.	Tail corn: Wght. per bushel lb.	Straw, chaff, &c. c.	Straw, chaff, &c. q.	Straw, chaff, &c. lb.
5	1886	No manure (after roots carted off—cotton cake plot)	17	1	18½	35·8	51·5	1	0	12	2·7	46·5	17	3	26½
	1887	” ” ”	10	2	26	20·9	55·1	2	2	10	5·9	49·5	16	1	23½
	1888	” ” ”	12	1	20½	25·5	54·6	1	1	15	3·6	43·0	18	0	8
	1889	” ” ”	12	1	15	25·2	51·9	0	0	21½	0·5	46·0	13	3	25
	1890	” ” ”	18	2	27	38·5	54·4	0	1	17½	0·9	51·0	20	1	18
	1891	” ” ”	10	3	17	23·5	51·9	0	2	3	1·6	37·0	14	1	11
	1892	” ” ”	12	2	0	26·5	52·8	0	0	16½	0·6	26·0	13	0	19
	1893	” ” ”	11	1	22	23·8	53·9	0	1	1	0·7	40·0	10	1	19
	1894	” ” ”	14	2	18½	31·1	52·8	0	0	24	0·7	32·0	15	2	8
	1895	” ” ”	6	2	27	14·6	51·6	0	0	8	—	—	8	3	16½
	1896	” ” ”	7	0	8½	15·4	51·6	0	0	21½	0·9	27·0	11	1	16
	1897	” ” ”	7	1	16½	15·6	53·0	0	3	12	2·4	40·0	10	1	24
6	1886	No manure (after roots carted off—maize meal plot)	17	0	1½	34·5	55·3	2	0	17½	4·8	50·9	19	0	12
	1887	” ” ”	12	2	27	25·7	55·6	1	0	23	2·7	49·5	17	3	15
	1888	” ” ”	12	1	12	25·3	54·6	1	1	20	3·6	44·5	19	1	22½
	1889	” ” ”	13	0	2½	26·6	54·9	0	0	25	0·6	44·5	18	0	21
	1890	” ” ”	16	3	13	34·7	54·4	0	1	13	0·8	49·0	17	3	22
	1891	” ” ”	9	3	3½	21·6	50·8	0	2	6½	1·6	30·0	13	0	24
	1892	” ” ”	11	0	11½	23·9	52·1	0	0	16	0·6	28·0	12	0	8½
	1893	” ” ”	10	3	27½	23·0	53·6	0	0	20½	0·5	44·0	9	1	11½
	1894	” ” ”	15	3	4½	33·7	52·5	0	1	1	0·9	33·0	16	3	23½
	1895	” ” ”	8	2	21	18·6	52·2	0	0	11½	—	—	11	0	4
	1896	” ” ”	6	3	13½	15·2	50·6	0	1	3½	1·1	29·0	12	0	25½
	1897	” ” ”	7	1	7½	15·8	51·8	0	3	24	2·8	39·0	11	0	11½

7	1886	No manure (after roots carted off—artificial equivalent of cotton cake dung plot)	19	2	7½	39·7	55·2	0	3	11	2·1	16·5	20	2	26
	1887	" " "	15	2	3½	31·1	56·0	0	3	17	2·0	50·5	20	0	23½
	1888	" " "	13	0	0½	26·8	54·4	2	0	24½	5·4	46·2	21	3	2½
	1889	" " "	14	3	18	30·3	55·0	0	0	21½	0·5	45·0	20	1	21
	1890	" " "	17	2	9½	35·8	55·0	0	1	10½	0·8	49·5	20	2	14
	1891	" " "	11	2	18½	25·9	50·5	0	2	1½	1·3	42·0	14	2	16
	1892	" " "	10	3	10½	23·3	52·0	0	0	17½	0·6	27·0	12	1	10½
	1893	" " "	12	0	22	25·5	53·6	0	0	20½	0·6	36·0	10	2	0½
	1894	" " "	13	0	15	28·6	51·4	0	1	2½	1·2	26·0	15	0	27
	1895	" " "	8	3	24½	19·4	51·7	0	0	11	—	—	10	3	18
	1896	" " "	5	3	11½	13·0	50·4	0	0	24	0·9	26·0	11	1	5½
	1897	" " "	8	0	2½	17·3	51·9	0	3	27½	2·7	41·0	12	0	8
8	1886	No manure (after roots carted off—artificial equivalent of maize meal dung plot	17	1	26½	34·8	56·3	1	0	26½	2·7	51·2	17	3	13½
	1887	" " "	14	3	5	29·7	55·9	1	0	26½	2·8	48·7	19	3	8½
	1888	" " "	12	1	3	25·3	54·4	1	1	13	3·4	45·0	22	1	10
	1889	" " "	14	1	24	29·2	54·8	0	0	23	0·5	46·0	19	0	20
	1890	" " "	15	3	23	32·5	54·9	0	0	27½	0·6	47·0	19	1	4½
	1891	" " "	13	1	8½	29·5	50·5	0	2	3	1·5	38·0	15	0	24
	1892	" " "	11	1	9	24·1	52·7	0	1	2½	1·0	31·0	12	0	24½
	1893	" " "	9	1	22	19·6	58·9	0	0	21	0·5	42·0	9	1	10½
	1894	" " "	12	0	5½	25·6	52·5	0	0	19½	0·6	35·0	14	0	19½
	1895	" " "	9	0	26	20·0	51·7	0	0	8½	—	—	11	1	24
	1896	" " "	6	0	25	13·6	51·1	0	0	24½	0·9	27·0	11	1	26
	1897	" " "	6	2	26	14·7	51·3	0	3	13	2·4	41·0	9	2	0

Results obtained in the Rotation Experiments—continued.

4. ROTATION WHEAT—1878-85.

Stackyard Field—Produce per acre.

Plot	Year	Manures per acre	Head corn Weight c.	q.	lb.	Head corn Bushels	Head corn Weight per bushel lb.	Tail corn Weight c.	q.	lb.	Tail corn Bush.	Tail corn Wght. per bushel lb.	Straw, chaff, &c. c.	q.	lb.
1	1878	After seeds fed off with sheep consuming 728 lb. decorticated cotton cake	20	0	8½	37·3	60·2	1	2	18	3·7	49·2	43	2	24
	1879	„ „ „	17	1	18½	36·4	53·4	1	1	15¼	3·4	49·0	52	3	17¾
	1880	„ „ „	9	2	17	21·2	51·0	0	2	15¼	1·5	47·5	34	0	26
	1881	„ „ „	29	1	1	54·6	60·0	0	2	20½	1·8	51·7	42	0	0
	1882	„ „ „	22	1	9¼	40·7	61·3	1	0	5½	2·1	55·1	50	3	20
	1883	„ „ „	21	1	0	39·6	60·0	3	0	8	6·5	52·4	45	1	6½
	1884	„ „ „	25	2	24	48·0	59·9	1	1	7	3·5	41·9	59	3	7
	1885	„ „ „	24	2	13¾	47·7	57·8	0	2	10¼	1·7	39·7	58	1	14
2	1878	After seeds fed off with sheep consuming 728 lb. maize meal	20	2	26	38·4	60·5	2	1	3	5·1	49·7	41	0	23
	1879	„ „ „	17	0	23½	35·5	54·2	2	0	7	4·5	51·0	54	3	15½
	1880	„ „ „	10	3	25	24·1	51·0	0	3	26	2·1	48·0	38	2	0
	1881	„ „ „	29	2	1½	55·0	60·0	1	1	0	2·4	57·2	42	0	17
	1882	„ „ „	22	2	8	41·5	60·9	0	3	13½	1·8	53·0	50	0	17½
	1883	„ „ „	21	2	0¼	39·8	60·5	3	0	2½	6·4	52·3	47	1	17½
	1884	„ „ „	27	0	15	49·9	60·9	0	3	10	2·4	39·0	58	2	24
	1885	„ „ „	27	0	2½	51·0	59·3	0	3	16½	2·1	48·2	57	0	4½

3	1878	After seeds fed off with sheep without cake or corn —top-dressed with artificial equivalent of dung from 728 lb. decorticated cotton cake	25	0	0½	46·3	60·5	1	3	10½	4·3	48·0	58	2	26
	1879	" " "	18	0	27½	37·9	54·0	2	0	6	4·8	48·0	64	0	18
	1880	" " "	9	0	16½	20·0	51·0	0	3	7½	1·9	47·0	39	2	18
	1881	" " "	29	3	26	56·4	59·5	1	0	13	2·5	51·5	48	2	18½
	1882	" " "	20	3	9	38·7	60·2	1	3	10¾	3·7	54·7	56	2	8
	1883	" " "	18	1	27	34·8	59·4	4	2	6¼	9·8	51·8	55	3	13½
	1884	" " "	24	2	2	45·0	61·0	0	3	18	2·4	40·1	52	2	15
	1885	" " "	22	3	21¾	43·7	58·8	0	1	19¾	1·1	44·0	52	2	21½
4	1878	After seeds fed off with sheep without cake or corn —top-dressed with artificial equivalent of dung from 728 lb. maize meal	19	3	10	36·3	61·2	1	1	7½	3·1	46·7	49	3	4
	1879	" " "	18	1	9½	37·7	54·5	1	3	12½	4·0	51·0	58	2	27
	1880	" " "	10	3	13¼	23·5	51·8	0	2	27¾	1·6	48·5	37	1	1
	1881	" " "	28	8	13	53·9	60·0	0	2	5	1·4	44·0	46	1	23¾
	1882	" " "	23	3	25	44·7	60·0	0	2	18¾	1·4	51·0	57	1	27½
	1883	" " "	21	2	26	40·9	59·5	2	2	4	5·5	51·8	53	3	8½
	1884	" " "	27	1	3	50·0	61·1	0	3	8¾	2·2	41·5	51	2	9
	1885	" " "	23	3	16	45·5	58·8	0	2	26¼	2·0	42·2	48	1	22¾

Results obtained in the Rotation Experiments—continued.

ROTATION WHEAT—1886–1897.

Stackyard Field—Produce per acre.

Plot	Year	Manures per acre	Head corn Weight c.	q.	lb.	Bushels	Weight per bushel lb.	Tail corn Weight c.	q.	lb.	Bush.	Wght. per bushel lb.	Straw, chaff, &c. c.	q.	lb.
1	1886	No manure (after tares—cotton cake plot)	10	3	22	20·5	59·85		—		—	—	14	0	0½
	1887	" " "	19	3	2	39·8	55·57	1	0	23½	3·1	44·2	28	0	19½
	1888	" " "	9	3	18	18·8	58·80	1	0	20	3·0	43·5	17	0	27
	1889	No manure (after clover—cotton cake plot)	14	0	7½	27·2	57·88	0	2	24½	2·3	34·7	28	3	21
	1890	" " "	22	2	5	41·2	61·22	0	3	15	2·1	46·7	33	2	19½
	1891	" " "	19	3	9½	43·1	51·51	1	2	4½	6·0	28·8	42	3	20½
	1892	" " "	14	2	2½	29·3	55·46	0	1	26½	1·8	29·0	27	1	15
	1893	" " "	20	3	1½	38·3	60·78	0	2	0	1·9	29·0	26	2	6
	1894	" " "	25	3	22	47·7	60·89	0	1	9½	0·9	43·0	41	0	6
	1895	" " "	16	3	6	31·1	60·53	0	1	0½	0·6	49·0	21	0	1½
	1896	" " "	20	0	4	35·9	62·56	0	1	23½	1·0	52·0	25	3	7
	1897	No manure (after peas—cotton cake plot)	13	0	25	23·4	63·15	0	3	9	1·9	50·0	20	1	13
2	1886	No manure (after tares—maize meal plot)	8	0	2	15·5	57·80		—		—	—	11	1	1½
	1887	" " "	17	3	23½	35·7	56·28	0	3	25	2·2	48·5	21	0	20½
	1888	" " "	10	0	14	19·3	58·75	0	2	18	2·1	34·7	17	2	4½
	1889	No manure (after clover—maize meal plot)	16	0	0½	30·3	59·07	0	2	7	1·6	39·0	31	0	19
	1890	" " "	21	1	26½	39·4	61·06	0	3	3½	2·0	43·0	30	3	15½
	1891	" " "	20	1	10½	41·2	55·34	1	2	11	4·5	39·2	43	2	19
	1892	" " "	14	0	16	28·5	55·51	0	2	16½	2·5	28·0	26	2	26½
	1893	" " "	22	2	12	41·4	61·08	0	3	16	2·6	38·0	29	0	23
	1894	" " "	25	1	17	46·4	61·31	0	1	19½	1·0	45·0	39	2	19½
	1895	" " "	14	3	0½	27·3	60·50	0	0	23½	0·5	47·0	17	3	21
	1896	" " "	17	3	11½	31·9	62·73	0	1	21	0·9	50·0	23	1	23½
	1897	No manure (after peas—maize meal plot)	13	2	16	24·2	63·04	1	0	8	2·4	51·0	19	2	7

3	1886	No manure (after tares—artificial equivalent of cotton cake dung plot)	10	3	15½	20 3	60·00	—			—	—	13	0	13
	1887	" " "	15	0	21	30·1	56·43	1	3	2	4·1	48·7	25	0	27½
	1888	" " "	9	3	13½	18·5	59·80	0	1	25	1·8	30·0	17	2	5½
	1889	No manure (after clover—artificial equivalent of cotton cake dung plot)	16	2	21	31·4	59·48	0	3	27	2·7	40 2	30	2	0½
	1890	" " "	21	3	11½	40 0	61·12	0	3	27	2 4	46 0	33	0	22½
	1891	" " "	23	2	3½	46·5	56·68	1	0	14½	3·6	34·7	44	2	2½
	1892	" " "	14	0	0	26·9	58·19	0	1	11	1·3	28 0	24	1	5½
	1893	" " "	22	0	13	40·6	60·97	0	3	4	2·2	40 0	29	3	16
	1894	" " "	24	1	18	44·9	60·92	0	1	12½	0 9	44·0	39	0	25
	1895	" " "	17	0	7	32·1	59·57	0	0	25½	—	—	20	2	24½
	1896	" " "	17	3	9	31·6	63·25	0	1	13	0·7	55·0	21	0	21
	1897	No manure (after peas—artificial equivalent of cotton cake dung plot)	12	2	3	22·2	63 07	0	3	12	1·9	50·0	18	0	3½
4	1886	No manure (after tares—artificial equivalent of maize meal dung plot)	7	3	17	15·1	58·80	—			—	—	10	3	8½
	1887	" " "	15	3	2	30·4	58 07	1	0	20	2·7	48·0	24	2	21½
	1888	" " "	9	2	24	18·4	59·20	0	2	23	2·1	37·5	16	3	16½
	1889	No manure (after clover—artificial equivalent of maize meal dung plot)	15	3	12½	29·9	59·50	0	3	23½	2·8	38 5	31	2	11½
	1890	" " "	20	3	14	38·3	60·69	0	3	8	2·0	45 0	34	0	7
	1891	" " "	23	1	21½	45·4	57·82	0	3	17½	2·6	39·0	42	1	5
	1892	" " "	15	0	2	28·7	58·55	0	1	21½	1·5	33 0	23	1	21
	1893	" " "	21	1	20½	39·3	61·02	0	3	15	2·1	46·0	30	3	5
	1894	" " "	25	0	3½	45·9	61·00	0	1	14	0·9	47·0	39	3	14¾
	1895	" " "	16	3	26½	31·0	61·33	0	0	25½	0·6	48 0	19	3	0
	1896	" " "	17	2	27	31·2	63·58	0	1	23	1·0	53·0	20	3	27
	1897	No manure (after peas—artificial equivalent of maize meal dung plot)	12	2	24	22·7	62·80	0	3	27	2·2	50·0	19	0	7½

Results obtained in the Rotation Experiments—continued.

ROTATION WHEAT—1886–1897—*continued*

Stackyard Field—Produce per acre.

Plot	Year	Manures per acre	Head corn: Weight			Head corn: Bushels	Head corn: Weight per bushel	Tail corn: Weight			Tail corn: Bush.	Tail corn: Wgt. per bushel	Straw, chaff, &c.		
			c.	q.	lb.		lb.	c.	q.	lb.		lb.	c.	q.	lb
5	1886	No manure (after peas—cotton cake plot)	13	0	24	25·1	58 8		—		—	—	16	1	5½
	1887	" " "	16	1	22½	30·3	60·7	1	0	5	2·2	53·0	23	0	23
	1888	" " "	12	0	4	23·2	58·2	1	1	5	3·4	43·2	21	3	1½
	1889	No manure (after clover—cotton cake plot)	13	1	27½	25·0	60·3	0	2	13½	1·8	39·0	24	3	21
	1890	" " "	20	1	8	37·7	60·4	0	3	20	2·3	45 0	30	2	16½
	1891	" " "	22	1	19½	43·5	58·0	0	3	21	2·6	40·5	40	3	24
	1892	" " "	12	0	27½	26·8	51·2	0	2	24½	3·4	23·5	28	3	19
	1893	" " "	14	3	6	26·9	61·7	0	2	16	1·9	37·0	19	1	8
	1894	" " "	24	1	2	44·4	61·2	0	1	27½	1·3	44·0	33	3	27½
	1895	" " "	15	2	17½	28·6	61·19	0	0	27	0·6	46·0	19	3	4
	1896	" " "	16	3	20	30·1	62·9	0	1	26	1·1	47·0	22	0	20
	1897	No manure (after peas—cotton cake plot)	10	3	1	19·0	63·4	0	2	22	1·6	50·0	15	2	15½
6	1886	No manure (after peas—maize meal plot)	12	1	15	23·4	59 2		—		—	—	14	3	15
	1887	" " "	16	1	23½	30·6	60·2	1	0	21½	2·5	52·0	23	3	19
	1888	" " "	11	2	22	22·7	57·6	1	1	20	3 9	40·7	21	1	5
	1889	No manure (after clover—maize meal plot)	15	0	10½	28·2	59·9	1	0	15½	2·8	45·2	27	0	8
	1890	" " "	18	3	4½	35·2	59·8	0	3	27½	2·5	43·5	27	3	23
	1891	" " "	22	1	1½	42·4	58 8	0	2	23	2·0	39·5	40	2	6
	1892	" " "	12	1	27	27·0	51·8	0	2	12½	3·2	21·0	29	0	15½
	1893	" " "	16	2	2½	30 4	60·9	0	2	16½	1·9	37·0	20	3	13
	1894	" " "	24	1	12½	44·8	60·9	0	1	25	1·2	45 0	33	0	11
	1895	" " "	13	2	18½	25 2	60 6	0	0	21	0·5	42·0	15	3	18
	1896	" " "	17	2	20½	31 5	62·9	0	1	26	1·1	50 0	21	3	4
	1897	No manure (after peas—maize meal plot)	10	2	25½	19·0	63·2	0	3	1½	1·7	49·0	14	2	16

7	1886	No manure (after peas—artificial equivalent of cotton cake dung plot)	13	1	12	24·8	60·2	—			—	—	15	2	17
	1887	" " "	18	0	17	34·4	59·1	1	0	22	2·6	51·5	27	3	1½
	1888	" " "	10	1	1	20·1	57·2	1	2	11	4·4	41·1	19	0	27½
	1889	No manure (after clover—artificial equivalent of cotton cake dung plot)	14	3	11½	27·7	60·1	0	2	8½	1·6	39·5	25	1	21½
	1890	" " "	21	3	0	40·3	60·4	0	3	13½	2·2	43·7	31	0	26½
	1891	" " "	23	2	10	45·5	58·0	1	0	16	3·3	39·0	15	2	13
	1892	" " "	12	3	3	26·2	54·7	0	1	27½	2·1	26·0	25	3	11½
	1893	" " "	16	1	13½	30·7	59·7	0	3	8	—	—	22	1	15
	1894	" " "	25	0	11	46·4	60·6	0	1	22½	1·2	41·0	37	1	25½
	1895	" " "	15	0	0	27·8	60·5	0	0	22½	0·5	45·0	18	3	2½
	1896	" " "	16	0	24	28·8	63·0	0	2	1	1·1	52·0	19	3	17½
	1897	No manure (after peas—artificial equivalent of cotton cake dung plot)	9	0	21	16·3	63·2	0	2	26½	1·6	51·0	12	3	0
8	1886	No manure (after peas—artificial equivalent of maize meal dung plot)	13	1	10½	24·8	60·1	—			—	—	16	3	15
	1887	" " "	18	0	26	36·1	56·5	1	0	17½	2·8	46·2	29	0	6½
	1888	" " "	10	0	0½	19·5	57·7	1	3	2	4·8	41·2	18	2	18
	1889	No manure (after clover—artificial equivalent of maize meal dung plot)	11	1	3	26·7	59·9	0	2	0½	1·4	39·5	23	2	15
	1890	" " "	20	1	4	37·5	60·5	0	3	20	2·4	43·2	31	1	18
	1891	" " "	23	2	13	45·7	57·9	0	3	22	2·6	40·2	41	1	23½
	1892	" " "	13	0	13½	26·4	55·6	0	2	3	2·5	23·0	24	2	15½
	1893	" " "	16	0	21½	29·9	60·7	1	1	18	4·2	36·7	21	2	19½
	1894	" " "	23	0	10	43·4	59·6	0	1	24	1·2	14·0	33	1	6½
	1895	" " "	15	2	13½	28·9	60·6	0	0	23½	0·5	47·0	18	2	3
	1896	" " "	15	0	2	26·8	62·7	0	1	19	0·9	53·0	18	1	5
	1897	No manure (after peas—artificial equivalent of maize meal dung plot)	10	0	7½	17·8	63·2	0	2	24½	1·6	50·0	13	3	13

SUMMARY OF RESULTS

Rotation Experiments—Stackyard Field.

1st Series, 1877–1885.

Average annual produce per acre during the first and second rotations, 1877–1885

Plot	Manure	Roots, 1877 1884				Barley, 1878 1885					Seeds 1877 1884	Wheat, 1878 1885				
		Mangels, 1877 1881		Swedes, 1882 1884		Head corn		Tail corn		Straw, chaff &c	Increase in live weight of 10 sheep feeding off seeds	Head corn		Tail corn		Straw, chaff, &c
		Roots	Leaves	Roots	Leaves	Bushels	Weight per bushel	Bushels	Weight per bushel			Bushels	Weight per bushel	Bushels	Weight per bushel	
		t c	t c	t c	t c		lb		lb.	c. q lb	lb		lb		lb	c q lb
1	Decorticated cotton cake dung	12 13	[illegible]	17 6	2 9	46 3	53 1	2 4	45 0	30 2 8	362¼	40 7	57 9	3 0	48 3	48 1 18
2	Maize meal dung	11 16	2 18	17 0	2 7	45 8	53 8	1 7	43 3	30 2 2	[illegible]56½	41 8	58 4	3 3	49 8	48 3 1
3	Artificial equivalent of cotton cake dung	16 11	3 12	19 17	2 16	48 7	52 7	3 0	44 6	35 0 16	248½	40 3	58 0	3 8	48 1	53 2 14
4	Artificial equivalent of maize meal dung	13 0	3 0	19 4	2 13	43 3	53 2	2 4	45 3	30 2 15	250½	41 6	58 4	2 6	47 1	50 3 8

2nd Series, 1885–1896.

Average annual produce per acre during the third, fourth, and fifth rotations, 1885–1896.

Plot	Manures per acre	Roots, 1885–1896: Swedes[1] Roots	Roots, 1885–1896: Mangels Roots	Barley, 1886–1896: Head corn Bush.	Barley: Head corn Weight per bushel	Barley: Straw, chaff, &c.	Leguminous crops, 1885–1896: Clover, 1888 Green Produce[3]	Clover, 1889–1895 Clover hay	Tares, 1886–1887 Dressed corn Bush.	Tares: Dressed corn Weight per bushel	Tares: Straw, &c.	Peas, 1886, 1887, and 1896[4] Dressed corn Bush.	Peas: Dressed corn Weight per bushel	Peas: Straw, &c.	Wheat, 1886–1896: Head corn Bush	Wheat: Head corn Weight per bushel	Wheat: Straw, chaff, &c.
		t. c. q. lb.	t. c. q. lb.		lb.	c. q. lb.	t. c. q. lb.	t. c. q. lb.		lb.	c. q. lb.		lb.	c. q. lb.		lb.	c. q. lb.
1	Roots fed off with sheep consuming 400 lb. decorticated cotton cake; 3 cwt. superphosphate to swedes	10 9 2 3	—	37·7	53·9	22 3 7	6 1 0 0	2 7 3 5	33·2	63·2	25 0 26	28·9[4]	61·4	20 1 7[4]	33·9	58·6	27 3 15
2	Roots fed off with sheep consuming 400 lb. maize meal; 3 cwt. superphosphate to swedes	10 10 0 12	—	34·7	53·7	20 1 25	7 8 3 10	2 9 0 12	34·5	64·0	21 1 6	29·0[4]	62·6	20 3 23[4]	32·1	59·0	26 3 15
3	Roots fed off with sheep without cake or meal; artificial equivalent of the cotton cake dung applied to succeeding barley; 3 cwt. superphosphate to swedes	10 10 1 19	—	49·6	53·5	21 3 5	8 7 1 12	2 11 0 19	33·2	64·6	20 3 2	29·1[4]	62·8	22 3 7[4]	33·0	59·7	26 3 22
4	Roots fed off with sheep without cake or meal; artificial equivalent of the maize meal dung applied to succeeding barley; 3 cwt. superphosphate to swedes	10 0 2 21	—	31·5	53·5	21 1 11	6 14 2 2	2 10 3 5	31·0	64·0	18 2 17	28·1[4]	62·0	19 2 17[4]	32·1	60·0	26 3 10
5	No manure (cotton cake plot)	10 14 0 8[2]	11 4 1 3	25·5	53·5	14 2 12	4 14 2 12	2 1 0 16	—	—	—	32·0	63·9	17 2 10	31·1	59·5	25 2 15
6	No manure (maize meal plot)	9 17 1 12[2]	11 12 0 2	25·7	53·3	15 0 25	4 11 2 8	2 6 0 4	—	—	—	31·5	64·3	16 1 7	31·0	59·3	25 0 15
7	No manure (artificial equivalent of cotton cake dung plot)	9 14 1 4[2]	11 19 0 25	27·2	53·2	16 1 0	3 11 3 21	2 7 1 0	—	—	—	30·9	63·9	16 3 1	32·1	59·4	26 1 6
8	No manure (artificial equivalent of maize meal dung plot)	8 8 3 14[2]	10 19 3 9	25·8	53·5	15 2 18	2 10 2 20	2 5 3 2	—	—	—	27·8	63·1	17 1 9	31·4	59·3	25 2 9

[1] The years 1886, 1890, and 1892, are excluded from the averages owing to entire or partial failure of crop.
[2] These results apply only to 1887, when, owing to failure of mangel plant, swedes (with 3 cwt. per acre of superphosphate) were grown on all the plots.
[3] Applies to 1888 only, the clover that year being weighed green.
[4] The results for plots 1, 2, 3, and 4, apply to 1896 only, peas being then grown on both halves, clover having failed.

D. *Rotation Experiments on the Comparative Manurial*
Lansome Field—

1. Barley, 1885, 1889, 1893, 1897.

Produce per acre.

Plot[1]	Year	Manures per acre used for barley	Head corn Weight	Head corn Bush.	Head corn Wght. per bush.	Tail corn Weight	Tail corn Bush.	Tail corn Wgt. per bush.	Straw, chaff, &c.
			c. q. lb.		lb.	c. q. lb		lb.	c. q. lb.
1	1885	Swedes fed off without additional food . .	8 0 25	18·7	49·1	—	—	—	13 0 14
	1889		13 2 27	27·7	55·5	0 1 8	0·7	50·0	18 0 14
	1893		14 3 14	31·6	52·6	0 0 25	—	—	17 0 12
	1897		19 0 7	38·6	53·3	0 0 25	—	—	23 3 23
2	1885	Swedes fed off with 400 lb. decorticated cotton cake	12 1 22	27·5	50·6	—	—	—	13 2 27
	1889		16 2 15	34·1	54·7	0 2 19	1·6	48·0	21 1 26
	1893		14 3 9	31·3	52·1	0 0 26	—	—	16 0 1
	1897		13 3 1	27·9	55·2	0 0 16	—	—	22 3 19
	1885	Swedes fed off, and barley top-dressed with decorticated cotton cake meal equivalent to the dung on plot 2	14 1 12	31·4	51·2	—	—	—	19 0 7
	1889		18 2 22	36·1	58·0	0 2 13	1·4	49·0	32 2 11
	1893		19 2 19	42·4	51·9	0 1 6	—	—	22 1 18
	1897		20 0 4	40·5	55·4	0 1 0	—	—	27 3 21
4	1885	Swedes fed off without additional food . .	10 2 17	25·7	50·3	—	—	—	12 0 11
	1889		16 1 24	33·5	55·0	0 1 3	0·6	48·0	17 2 17
	1893		19 2 21	43·0	51·7	0 1 1	—	—	21 1 16
	1897		17 0 26	34·7	55·6	0 2 12	1·7	40·0	23 2 17
5	1885	Swedes fed off with 400 lb. maize meal . . .	8 2 10	19·0	50·5	—	—	—	10 2 7
	1889		17 2 4	25·6	55·1	0 1 4	0·6	50·0	19 2 17
	1893		18 0 20	39·1	52·1	0 0 25	—	—	19 1 22
	1897		12 2 2	25·0	56·0	0 1 25	1·3	42·0	16 2 18
6	1885	Swedes fed off, and barley top-dressed with maize meal equivalent to the dung on plot 5 . .	10 1 9	23·5	49·2	—	—	—	10 1 22
	1889		15 1 16	31·3	55·1	0 0 22	0·5	48·0	16 2 20
	1893		16 0 15	34·8	52·0	0 0 19	—	—	16 1 25
	1897		19 0 8	39·6	53·9	1 0 8	3·0	40·0	29 0 16

[1] Plots ¼ acre each.

Values of Decorticated Cotton Cake and Maize Meal.
1885–1897.

2. WHEAT, 1887, 1891, 1895.

Produce per acre.

Plot	Year	After clover hay—manures used for barley only	Head corn: Weight	Head corn: Bush.	Head corn: Wght. per bushel	Tail corn: Weight	Tail corn: Bush.	Tail corn: Wgt. per bush.	Straw, chaff, &c.
			c. q. lb.		lb.	c. q. lb.		lb.	c. q. lb.
1	1887	Unmanured plot	12 2 8	22·4	62·0	2 1 1	4·2	60·7	27 1 20
	1891		15 0 4	27·6	61·0	0 0 24	0·6	38·0	35 3 19
	1895		13 2 20	24·3	63·1	0 0 11	—	—	17 1 15
2	1887	Decorticated cotton cake dung plot	13 3 24	24·6	63·5	2 3 20	5·3	61·5	27 3 9
	1891		19 3 21	36·0	61·9	0 0 26	0·6	42·0	35 0 1
	1895		15 0 25	27·2	62·7	0 0 13	—	—	18 3 5
3	1887	Decorticated cotton cake meal (as top-dressing) plot	15 3 15	27·9	63·7	3 1 8	6·0	62·0	32 0 10
	1891		24 0 26	43·7	62·1	0 0 20	0·6	34·0	41 0 16
	1895		16 1 25	29·7	62·1	0 0 18	—	—	17 1 27
4	1887	Unmanured plot	17 0 2	29·9	63·6	2 2 1	4·6	61·0	31 0 9
	1891		25 3 0	46·6	62·1	0 1 9	0·8	48·0	41 0 20
	1895		15 2 22	28·3	62·1	0 0 15	—	—	21 2 2
5	1887	Maize meal dung plot	15 0 13	26·6	63·6	2 3 21	5·3	61·5	30 0 12
	1891		21 3 3	39·3	62·1	0 0 27	0·6	44·0	35 1 26
	1895		16 3 4	30·1	62·5	0 0 16	—	—	21 0 13
6	1887	Maize meal (as top-dressing) plot	14 2 16	26·0	63·0	2 3 14	5·1	62·5	31 2 1
	1891		17 3 27	32·8	61·3	0 1 4	0·8	40·0	34 2 3
	1895		14 2 20	26·6	61·8	0 0 19	—	—	22 2 16

Rotation Experiments on the Comparative Manurial Values of Decorticated Cotton Cake and Maize Meal—continued.

Lansome Field—1885-97—*continued.*

3. Seeds, 1886, 1890, 1894—Produce per acre.

Plot	After barley—manures used for barley only.	Clover hay, 1886 (t. c. q. lb.)	Clover hay, 1890 (t. c. q. lb.)	Clover hay, 1894 (t. c. q. lb.)
1	Unmanured plot	1 11 1 0	2 11 1 16	1 12 1 16
2	Decorticated cotton cake dung plot	1 11 3 20	2 8 3 4	2 0 2 24
3	Decorticated cotton cake meal (as top-dressing) plot	1 14 1 20	3 10 3 4	2 0 2 24
4	Unmanured plot	1 11 1 20	2 19 2 16	2 4 2 16
5	Maize meal dung plot	1 12 0 8	2 13 3 16	2 8 2 20
6	Maize meal (as top-dressing) plot	1 9 1 0	2 12 1 8	2 4 2 24

4. Roots, 1888, 1892, 1896—Produce per acre.

Plot	After wheat—manures used for barley only	Swedes, 1888		Swedes, 1892		Swedes, 1896	
		Roots (t. c. q. lb.)	Leaves (t. c. q. lb.)	Roots (t. c. q. lb.)	Leaves (t. c. q. lb.)	Roots (t. c. q. lb.)	Leaves (t. c. q. lb.)
1	Unmanured plot	5 5 1 16	1 10 2 12	10 7 1 8	1 13 0 24	11 3 0 24	1 10 2 16
2	Decorticated cotton cake dung plot	7 13 1 16	2 1 0 20	12 7 1 24	1 13 0 0	10 16 3 24	1 8 2 0
3	Decorticated cotton cake meal (as top dressing) plot	12 8 3 8	2 11 0 0	16 19 0 12	1 15 0 0	14 9 1 20	1 10 3 20
4	Unmanured plot	8 16 0 0	1 18 0 12	16 8 2 24	1 14 2 8	14 5 3 21	1 9 0 24
5	Maize meal dung plot	7 9 3 0	1 15 0 8	15 2 0 16	1 12 1 20	12 17 0 24	1 7 2 0
6	Maize meal (as top-dressing) plot	6 11 0 0	1 6 1 12	12 9 3 16	1 10 0 16	9 14 3 20	1 5 0 0

SUMMARY OF RESULTS.

ROTATION EXPERIMENTS Lansome Field, 1885–1896.

Average annual produce per acre during the first three rotations, 1885–1896.

Plot	Manures per acre used for barley	Barley, 1885, 1889, 1893: Dressed grain: Bushels	Barley: Dressed grain: Weight per bushel	Barley: Straw, chaff, &c. (including tail corn)	Clover, 1886, 1890, 1894: Clover hay	Wheat, 1887, 1891, 1895: Dressed grain: Bushels	Wheat: Dressed grain: Weight per bushel	Wheat: Straw, chaff, &c. (including tail corn)	Swedes, 1888, 1892, 1896: Roots	Swedes: Leaves
			lb.	c. q. lb.	t. c. q. lb.		lb.	c. q. lb.	t. c. q. lb.	t. c. q. lb.
1	Swedes fed off without additional food	26·0	52·4	16 1 6	1 18 1 11	24·8	62·3	27 3 2	8 18 2 16	1 11 1 27
2	Swedes fed off with 100 lb. decorticated cotton cake	31·1	52·5	18 1 14	2 0 1 25	29·3	62·7	28 1 6	10 5 3 21	1 11 0 25
3	Swedes fed off, and barley top-dressed with decorticated cotton cake meal containing the same amount of manurial constituents as the dung used on Plot 2, but applied direct as meal	36·6	53·7	25 0 0	2 8 2 16	33·8	62·6	31 1 21	11 12 1 23	1 18 3 25
4	Swedes fed off without additional food	33·1	52·2	17 0 25	2 5 0 27	31·9	62·6	32 1 0	13 3 2 7	1 13 3 21
5	Swedes fed off with 100 lb. maize meal	31·2	52·6	16 2 25	2 4 3 15	32·0	62·7	30 0 1	11 16 1 13	1 11 2 19
6	Swedes fed off, and barley top-dressed with maize meal containing the same amount of manurial constituents as the dung used on Plot 5, but applied direct as meal	29·9	52·1	14 2 17	2 2 0 11	28·5	62·0	30 2 19	9 12 3 21	1 7 0 19

APPENDIX.

Table of Rainfall at the Woburn Experimental Farm, 1882–97.

Month	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January . .	1·33	1·95	1·92	1·36	2·18	1·79	·55	1·09	1·97	1·53	·88	1·77	1·63	1·69	·91	2·21
February . .	1·50	2·98	·82	1·71	·32	·41	1·33	1·46	·82	—	1·33	1·96	1·59	·20	·36	2·31
March . . .	·98	·89	1·05	1·03	1·36	1·05	2·30	1·99	1·78	·94	·50	·27	1·10	1·38	2·60	3·01
April . . .	3·11	1·55	1·52	2·11	1·63	1·33	2·12	2·43	·61	1·32	·77	·18	1·23	1·21	·81	1·60
May . . .	1·75	1·10	·82	2·93	3·51	1·30	·97	4·45	1·34	2·86	1·30	1·35	2·29	·10	·30	1·35
June . . .	2·10	2·89	1·53	1·78	1·44	1·69	2·32	1·04	1·69	1·74	2·30	1·00	2·18	·28	2·18	1·90
July . . .	2·41	3·07	2·57	·17	2·17	·64	4·95	2·84	2·73	2·16	2·05	4·10	3·31	4·28	·71	·42
August . .	1·61	·84	1·28	2·55	1·36	·85	2·03	1·55	1·47	4·36	3·47	2·38	2·62	3·21	1·92	4·02
September . .	2·58	3·91	1·48	4·10	1·25	1·77	1·16	1·98	·46	1·18	3·25	·97	1·41	·79	5·96	2·06
October . .	4·72	1·82	1·19	3·69	3·10	·96	·75	3·04	1·43	6·35	3·60	2·54	3·16	2·49	3·03	·89
November . .	3·39	2·37	·95	3·15	2·52	2·19	3·81	·97	2·32	1·94	1·51	1·81	4·55	3·87	1·18	1·00
December . .	2·33	·63	2·71	·73	3·61	1·06	1·59	·83	·18	3·49	1·26	1·22	1·27	1·60	2·91	2·79
Totals . .	28·14	21·20	17·81	25·97	25·05	15·04	23·94	23·67	16·80	27·87	22·22	19·88	26·37	21·16	22·90	23·62

Average annual rainfall (taken over 16 years 1882–97) 22·81 in.

Official Reports.

REPORT OF THE COUNCIL

TO THE

HALF-YEARLY GENERAL MEETING OF GOVERNORS AND MEMBERS OF THE SOCIETY,

HELD IN THE HALL OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY,

20 *Hanover Square, W.*,

ON THURSDAY, DECEMBER 8 1898,

THE EARL OF COVENTRY (President) in the Chair.

THE Council have to report that the list of Governors and Members has undergone the following changes during the half-year which has elapsed since the Anniversary General Meeting on May 22 last:—1 new Governor and 159 Members have joined the Society; whilst the deaths of 1 Honorary Member, 6 Life Governors, 43 Life Members, and 85 Annual Members have been reported. A total of 4 Members have been struck off the books under Bye-Law 10, owing to absence of addresses; 35 under Bye-Law 11, for arrears of subscription; and 49 have resigned.

2. Since the last meeting, the Society has lost by death its Senior Trustee (Sir Thomas Dyke Acland, Bart.) and its Senior Honorary Member (Lord Playfair), both of whom had been connected with the Society in its very early days. Sir Thomas Acland was a Member of the original Committee of Management of the English Agricultural Society, and he had been associated in various capacities with the Royal Agricultural Society for the long period of sixty years: dying, indeed, in his ninetieth year, on the sixtieth anniversary of his admission as a Member. Lord Playfair had been an Honorary Member of the Society since the year 1842, and was the Society's first Consulting Chemist. Appointed to this position in 1843, he held it for four years, being succeeded in 1847 by the late Professor Way. By the loss of these two distinguished men, the few remaining personal links which connect the Society with the period of its original formation are still further diminished.

3. By the death of the Earl of Lathom, G.C.B., on November 19, 1898, the Society has been deprived of the services of another prominent Member, who joined the Council in 1872. His Lordship (as Lord Skelmersdale) was President of the Society for the Liverpool Meeting of 1877, and he was elected a Vice-President in 1878. The Council have also to regret the loss of their esteemed colleague, Mr. W. T. Scarth, who died very suddenly on August 9, 1898. Mr. Scarth became a Member of the Society in 1845 and of the Council in 1886.

4. Amongst other Governors and Members whose loss by death the Society has had to deplore since the General Meeting in May last are :—The Duke of St. Albans, the Earl of Desart, the Earl of Winchilsea and Nottingham, Viscount Lismore, Baron Dimsdale, Sir H. W. Peek, Bart., Sir W. E. Welby-Gregory, Bart., General Sir Patrick Talbot, K.C.B., Mr. William Barford, of Peterborough ; Mr. E. H. Bentall, of Maldon (a member since 1843) ; Mr. William C. Booth, Mr. Richard Christy, Mr. J. J. Colman, Mr. Charles C. Cotes, General Crutchley, Major Jocelyn Ffoulkes (a member since 1847) ; Mr. William C. Little, Mr. Charles T. Murdoch, M.P., Mr. Thomas Owen, M.P., Mr. Arthur Pease, M.P., Colonel William Pinney (a Foundation Life Governor) ; Mr. Abel Smith, M.P., Mr. John Manners Sutton, and Mr. Thomas B. C. West.

5. These and other changes bring the total number of Governors and Members now on the Register to 11,034, divided as follows :—

10 Foundation Life Governors (Members elected before the granting of the Charter on March 26, 1840);
78 Governors paying an annual subscription of 5*l.* ;
105 Life Governors ;
7,151 Members paying an annual subscription of 1*l.* ;
3,553 Life Members ;
113 Life Members by Examination ;
24 Honorary Members ;

11,034 Total number of Governors and Members ; as against a total of 11,246 Members at the same period last year.

6. To fill the vacancy caused by the death of Sir Thomas Acland, Earl Spencer, K.G. (Vice-President), has been elected a Trustee of the Society, the vacant Vice-Presidency being filled by the election of the Duke of Bedford, and the seat on the Council by the election of Lord Arthur Cecil, of Orchardmains, Tonbridge, Kent.

7. The Society's Fifty-ninth Annual Country Meeting was held at Four Oaks Park, Sutton Coldfield, near Birmingham, from the 20th to the 24th June last, and was honoured by a visit from H.R.H. the Prince of Wales on Wednesday, June 22. The Lord Mayor and Corporation of Birmingham and the Mayor and Corporation of Sutton Coldfield extended a cordial welcome to the Society, and the Local Committee contributed the handsome sum of 1,145*l.* to the Prize List. The result was an exhibition of

Live Stock, Implements and Produce, that in point of merit and size has rarely been surpassed. It is therefore the more to be regretted that the anticipations which had been formed as to the attendance of the public were not realised. This may have been partly due to adverse weather on one or two of the days of the Show ; but the principal reason for the disappointing attendance was the breakdown of the railway arrangements for passenger traffic over the London and North Western line. Under these circumstances, little surprise will be felt that the financial result of the Meeting, as duly certified by the Auditors, is an excess of expenditure over receipts of 1,567*l.* 16*s.* 2*d.* This deficit would have been larger but for the generosity of the Birmingham Committee, who, with the same spirit which prompted the ready invitation to the Society to hold its meeting of 1898 at Birmingham when it became necessary to postpone the visit to Maidstone till next year, has handed over from the surplus of the Local Guarantee Fund the handsome sum of 645*l.* to the credit of the Society.

8. An agreeable feature of the General Meeting of Governors and Members held in the Birmingham Showyard was the presentation by the President in the Society's name of silver plate and an illuminated address to the Hon. Cecil Parker, who, in consequence of increasing calls upon his time, had intimated his inability to offer himself for re-election as Honorary Director at the expiration of his second term of office after the Birmingham Meeting. On the motion of H.R.H. the Duke of York, at the Council Meeting of May 25, 1898, Mr. Parker was unanimously elected a Life Governor of the Society. Mr. Percy E. Crutchley was at the same meeting elected Honorary Director for the three years ensuing the Birmingham Meeting in succession to Mr. Parker. Mr. Crutchley will be assisted in the administration of the business connected with the Country Meetings by Mr. J. E. Compton-Bracebridge, who was selected by the Council for the new office of Assistant Director, after a careful consideration of the claims of the various candidates for the post.

9. The Council have decided that the Maidstone Meeting shall open on Monday, June 19, 1899, and close on the following Friday evening. The Implement Yard and Dairy will be open to members of the Society and the public on the previous Saturday, June 17. The plan followed at the Birmingham Meeting of judging the produce on the Saturday before the opening of the complete show having proved successful, the Council have decided to continue the practice and to extend it at the Maidstone Meeting to the poultry as well.

10. The final date for the receipt of entries in the Implement Department has been fixed for Wednesday, March 15, 1899, although post entries at double fees may be tendered up to Saturday, April 1, 1899. For Live Stock, including Horses, Cattle, Sheep, and Pigs, the entries will close on Saturday, April 15, at 10*s.*

per entry; on Monday, May 1, at 15*s.* per post entry; and finally, on Monday, May 15, at 1*l.* per late entry. For Poultry and Farm Produce, the entries will close on Monday, May 1, at 2*s.* 6*d.* per entry, and finally, on Monday, May 15, at 5*s.* per post entry. Double fees will be payable by non-Members of the Society. An exhibitor will be permitted to make in the Classes for Live Stock and Poultry as many entries in the Class as there are prizes offered in that Class. Provision will be made for enabling exhibitors who have already entered animals to substitute for them entries of other animals in the same class up to Wednesday, May 31, on payment of a registration fee of 5*s.* (non-Members double).

11. The detailed Regulations for the Exhibition and Trial of Implements at Maidstone have now been settled. The following Prizes will be offered by the Society :—

For the best Machine for Washing Hops with liquid insecticides, to be worked by horse power or mechanical power.
Prize of 50*l.*

For the best Cream Separator: Power machine, suitable for use on a farm. *Prizes of* 20*l. and* 10*l.*

For the best Cream Separator: Hand machine, the power taken to drive the same not to exceed 2,500 foot lbs.
Prizes of 20*l. and* 10*l.*

12. The Maidstone Local Committee also offer a Prize of 20*l.* for the best machine for the evaporation of fruit and vegetables, and two Prizes of 5*l.* each for the best package for the carriage of (*a*) hard and (*b*) soft fruit respectively.

13. The Prize sheet for Stock, Poultry and Produce has been definitely settled, and will be issued immediately. The Prizes offered in all departments (exclusive of champion Prizes and Medals given by various Breed Societies) amount in all to 6,354*l.*, to which the Maidstone Local Committee contribute 1,230*l.*

14. The special prizes offered by the Maidstone Local Committee include six Classes for Hunters, two for Hackneys, two for Ponies, two for Shetland Ponies, eight for Polo Ponies, three for Harness Horses, one for Clydesdales, and two for Agricultural Geldings; two Classes for Sussex Cattle; one Class for Lincoln Sheep, one Class for Southdown Sheep, three Classes and two Champion prizes for Kentish or Romney Marsh Sheep.

15. The Classes for Live Stock provided by the Society itself will include Hunters, Cleveland Bays and Coach Horses, Hackneys, Ponies, Shires, Clydesdales, and Suffolk Horses. Under the terms of a resolution passed by the Council on November 2, 1898, no prize will be awarded to any animal entered in the breeding classes for horses unless such animal, after a veterinary examination, shall be pronounced free from indications of hereditary disease. In the Classes for Cattle, prizes will be offered by the Society for the Shorthorn,

Hereford, Devon, Sussex, Longhorn, Welsh, Red Polled, Aberdeen Angus, Galloway, Ayrshire, Jersey, Guernsey, Kerry, and Dexter breeds, as well as Classes for Dairy Cows both pure and cross-bred. The Classes for Sheep will include Leicesters, Cotswolds, Lincolns, Oxford Downs, Shropshires, Southdowns, Hampshire Downs, Suffolks, Border Leicesters, Kentish or Romney Marsh, Wensleydales, Devon Long Woolled, Somerset and Dorset Horned, Cheviots, Black-faced Mountain, Herdwicks, and Welsh Mountain. The date on which Sheep generally must have been shorn has been altered, and is now the 1st of March instead of the 1st of April. The prizes for Pigs will include the Large White, Middle White, Small White, Berkshire, and Tamworth breeds.

16. Prizes will also be given for useful descriptions of Poultry, including Table Fowls and Ducks; for Butter; for Cheddar, Cheshire, Stilton, Wensleydale, Cream, and other British Cheeses of 1899 make; and for Cider and Perry. The British Beekeepers' Association will continue their prizes for Hives, Honey and Bee Appliances.

17. There will also be a competition open to the United Kingdom of Shoeing Smiths in two Classes—viz. for Light and Heavy Horses—and Prizes amounting to 16*l.* will be offered in each Class. The Worshipful Company of Farriers have offered to present the Freedom of their Guild, free of cost, to the winner of the First Prize in each Class, provided the Judges consider that sufficient ability has been displayed. The Registration Committee of the Farriers' Company will also admit, free of charge, the First Prize winners in these competitions to the Official Register of Farriers or Shoeing Smiths, and, on payment of the usual fees, all other competitors who shall duly satisfy the Judges of their efficiency.

18. The Council have decided to offer the following prizes for Implements in connection with the Society's Annual Country Meeting for 1900, to be held on the Knavesmire in the City of York:

Class I.—Cultivator, suitable for general purposes	1st prize, 40*l.*; 2nd, 20*l.*
" II.—Milking machine	Prize of 50*l.*
" III.—Sheep-shearing machine, to be worked by power	Prize of 20*l.*
" IV.—Sheep-shearing machine, to be worked by hand or foot	Prize of 10*l.*

19. The question of the regulations enforced by District Councils and Municipal Authorities having jurisdiction in rural areas, with regard to the amount of cubic air space in cow-byres, has engaged the attention of the Council from time to time during the past year. On December 13 last, a small deputation waited upon the President of the Local Government Board for the purpose of drawing his attention to the present anomalous state of things, whereby regulations applicable solely to populous centres are liable to be imposed upon sparsely populated areas, and of suggesting that

the Board should itself issue Model Regulations for the guidance of Local Authorities in this matter. A reply was received from the Local Government Board on December 29, 1897, stating that the suggestion should receive attention, but that it appeared to be desirable to defer any action of this kind until after the issue of the Report of the Royal Commission on Tuberculosis. This Report was issued in April last, and the Council at their meeting on May 4 forwarded the following resolution to the Local Government Board: "The Council strongly desire to express their concurrence with the recommendations of the Royal Commission on Tuberculosis with regard to the amount of cubic air space in cowsheds, especially with that part of the report which draws a distinction between the requirements in populous and non-populous places, whether technically urban or rural." On July 27 last, the Council addressed a further letter to the President of the Local Government Board, urging the importance of issuing without delay model forms of regulations which would carry into effect the recommendations of the Royal Commission on Tuberculosis, so as to place this—to agriculturists—very important question upon a more satisfactory basis than at present. The Council still await the decision of the Local Government Board; but they understand that the matter is at present receiving Mr. Chaplin's special attention.

20. The Society's Silver Medal has been conferred upon Mr. Charles Radway, of Latton Field, Cricklade, and the Bronze Medal upon Mr. Thomas Wolsey, of Shepperton House, Lee Road, S.E., as the result of the examination of students of cattle pathology (including the diseases of cattle, sheep, and swine) conducted by the Royal Veterinary College under the new scheme referred to in the last Report of the Council.

21. The fees payable by Members of the Society for the examination, at the Royal Veterinary College, of the viscera of poisoned animals have been reduced, and the scale now in force is as follows:—

	£	s.	d.
1. Personal consultation with a veterinary professor	0	10	6
2. Consultation by letter	0	10	6
3. Post-mortem examination of an animal, and report thereon	1	1	0
4. Chemical examination of viscera for any specified metallic poison	0	10	6
5. Chemical examination of viscera for all metallic poisons	1	0	0
6. Chemical examination of viscera for all vegetable poisons	1	0	0
7. Chemical examination of viscera, complete, for metals and alkaloids	2	0	0

(These fees do not apply to cases which involve a visit to the locality.)

22. The Council observe with satisfaction that pleuro-pneumonia appears to have been at length exterminated, no case of the disease having been detected since the second week of January last. The repressive measures enforced against rabies have also had most gratifying results, only two cases having been reported since July

last, and only sixteen altogether during the present year. Anthrax and glanders have varied but little from the rate of prevalence exhibited in recent years, and the swine-fever returns are unfortunately in excess of those for the same period of last year.

23. In the Department of Comparative Pathology and Bacteriology established at the Royal Veterinary College by the aid of a grant from the Society, specimens from 126 cases of disease have been received for examination. Some experiments bearing on the vaccination of sheep and cattle against anthrax and quarter-evil, and others regarding the causation of papillomatous growths in dogs and suppuration after castration in horses, have been made. The investigations regarding generalisation of tuberculosis in cattle have been continued.

24. A somewhat larger number of samples has been sent to the Laboratory for analysis during the past year by Members of the Society, than was the case in 1897. The total is 861 as against 838 in 1897. The improvement noted last year in the genuineness of both fertilisers and feeding-stuffs has been continued. The principal exception to this is in foreign-made linseed cakes, these being frequently bad in condition, impure, and even harmful. Basic slag is a fertiliser still much in favour, but the necessity of checking its quality by analysis has often been exemplified.

25. A considerable extension of the Society's experimental work at Woburn has been made by the establishment of a new Laboratory at the Experimental Farm, where there is now a resident chemical assistant All analyses connected with the Woburn Experiments are conducted on the spot, and the various samples and specimens are kept at Woburn for reference. The account of the first 20 years (1877–96) of the Woburn Field Experiments will be completed by the publication in the forthcoming number of the Journal of the harvest results for each individual year since the commencement in 1877. This Part of the Journal will also include accounts of the Feeding Experiments conducted during the winter of 1897–8. A further series of Feeding Experiments has been instituted for the present winter. Experiments on the prevention of "Potato disease" by the use of "Bouillie Bordelaise" have confirmed previous experience that, even in a season like the past, when little or no disease appears, a larger crop is obtained where "spraying" is done than where it is not. The experiments on "Finger and Toe" in Turnips have been continued, and, the disease having been very prevalent, the results have been much more marked than usual. The only really effectual remedies out of a considerable number tried (including sulphate of iron, sulphate of copper, salt, kainit, bleaching-powder, caustic soda, and borax) have been lime and gas-lime, while basic slag has to a certain, but much less, extent, been also useful.

26. The "Pot-culture" station erected at Woburn for the purpose of carrying out the experiments of the Hills Bequest has

been thoroughly equipped, and the crops of the first season have been duly grown and gathered. Though the first year's work has necessarily been of a tentative character, there are already indications of much that will prove of interest in the future.

27. The Grass Experiments carried on by the Society over the country were visited by the Consulting Botanist in the early part of the summer, but the subsequent drought destroyed, in most places, the opportunity of any definite conclusions being arrived at for this year. The experiments will continue, however, to be kept under observation.

28. The Consulting Botanist reports that the seeds of grasses and clovers have attained a greater purity than ever before, and the germination has, with few exceptions, been satisfactory, though the differences between the lowest and the highest germinations have been considerable. An increasing number of inquiries have been received relating to diseases of plants. The injury to clover, trefoil and sainfoin from the parasitic fungus *Sclerotinia* has been very serious. As important is the destruction of mangolds by *Phoma*, another parasite, which first showed itself in England in the autumn of 1897 and has reappeared this year. Efforts are being made to arrest the progress of the disease by the destruction of the leaves and roots that have been attacked by the fungus. Cases of poisoning—one of cattle by Water Dropwort, the other of horses by Dog's Mercury—have been investigated.

29. The Zoologist reports that the abnormal nature of the past season has resulted in some specially severe caterpillar and aphis attacks. Applications with regard to some of the more familiar farm pests have been unusually few during the past six months, but their work may in some cases have been attributed to the ill effects of the drought. The new apple pest in Devonshire has been investigated on the spot, and proves to be the caterpillar of a small Tineid moth. The mature insect has not yet been obtained, but the matter is still under investigation.

30. As the result of the Society's Examination in the Science and Practice of Agriculture, held from May 10 to May 14 last, the following fourteen candidates, placed in order of merit, gained First-Class Certificates. The first candidate (having obtained over three-fourths of the maximum number of marks, 1,500) was also awarded the Life Membership of the Society and the Gold Medal. The second, third, fourth, and fifth candidates (having obtained over two-thirds of the maximum number of marks) received the Life Membership of the Society and the Silver Medal.

1. THOMAS HACKING, Durham College of Science, Newcastle-on-Tyne.—(1,154 marks.) *Gold Medal and Life Membership of the Society.*
2. SAMUEL FRASER, Agricultural and Horticultural School, Holmes Chapel, Cheshire.—(1,111 marks.) *Silver Medal and Life Membership of the Society.*

3. { JOHN OLLERTON PEET, The University, Edinburgh.—(1,096 marks.) *Silver Medal and Life Membership of the Society.*
STANLEY RACKHAM, The Agricultural College, Aspatria.—(1,096 marks.) *Silver Medal and Life Membership of the Society.* }

5. JOHN LESLIE, The University, Edinburgh. — (1,070 marks.) *Silver Medal and Life Membership of the Society.*
6. JAMES PIMLOTT, Agricultural and Horticultural School, Holmes Chapel, Cheshire.
7. ROBERT GWILLIM, The Agricultural College, Aspatria.
8. JOHN WILLIAMSON, Agricultural and Horticultural School, Holmes Chapel, Cheshire.
9. ERIC RICHARDSON, University College, Nottingham.
10. EDMUND WALLER, Royal Agricultural College, Cirencester.
11. FRED SMITH, Agricultural and Horticultural School, Holmes Chapel, Cheshire.
12. WILLIAM HENRY BEBBINGTON, Agricultural and Horticultural School, Holmes Chapel, Cheshire.
13. WILLIAM ARTHUR BRIGGS, University College, Nottingham.
14. JOHN HUBERT SOANS, University College, Nottingham.

31. The following ten candidates having passed in Agriculture and in three of the four other compulsory subjects, received Second-Class Certificates :—

15. SYDNEY FRANCIS ASHBY, The University, Edinburgh.
16. ERIC ARTHUR NOBBS, The University, Edinburgh.
17. WILLIAM REYNOLDS, Agricultural and Horticultural School, Holmes Chapel, Cheshire.
18. THOMAS NEWTON, Agricultural and Horticultural School, Holmes Chapel, Cheshire.
19. BERNARD WILLIAM BULL, Agricultural and Horticultural School, Holmes Chapel, Cheshire.
20. EDMUND BRAND, The Agricultural College, Uckfield.
21. ARTHUR PRESTON KER, The Agricultural College, Aspatria.
22. HENRY R. WOODFINE, The Agricultural College, Uckfield.
23. CYRIL JOHN WHITBREAD, University College, Nottingham.
24. ALEXANDER SCOTT CROMAR, University College, Nottingham.

32. Twenty-eight candidates presented themselves for the Annual Examination in the Science and Practice of Dairying, conducted jointly by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland. Of the seventeen candidates examined by the Royal Agricultural Society at Reading from September 26 to 30, the following eleven satisfied the Examiners, and thereby became entitled to receive the National Diploma in the Science and Practice of Dairying :—

LAWRENCE ABRAM, Glebe Lane, Banks, Southport.

Alexander Scott Cromar, Midland Dairy Institute, Kingston Fields, Derby.
Charles William Tisdale Davies, South Eastern Agricultural College, Wye, Kent.
Alfred George Edwards, Dairy Institute, Worleston, Cheshire.
Miss S. Blanche J. Forrester, British Dairy Institute, Reading.
Samuel Fraser, Dairy Institute, Worleston, Cheshire.
Miss Eliza Jane Freeman, Town Green, Aughton, Ormskirk.
William Newall Platt, Rodway Farm, Wellington, Salop.
Arthur Myers Smith, British Dairy Institute, Reading.
Miss Constance Jessie Sully, Dairy Institute, Worleston, Cheshire.
Richard Squire Thorne, British Dairy Institute, Reading.

33. Of the fifteen candidates examined by the Highland and Agricultural Society at Kilmarnock from October 4 to 7 last, the following thirteen were successful :—

Miss Sarah S. Anderson, Hosenette Farm, Stonehouse, Lanarkshire.
Miss Janet Campbell, 135 Wellington Street, Glasgow.
Miss Jeanie Carruthers, Netherton, Auchenheath, Lanarkshire.
Thomas Harrison, Gilling's Creamery, Swindon, Wilts.
John Leslie, Kinninvie, Mannofield, Aberdeen.
Wilson McMaster, Challoch, Dunragit, Wigtownshire.
John G. McMillan, Fellnaw, Ringford, Kirkcudbrightshire.
John Marchbank, Devonburn, Lesmahagow, Lanarkshire.
Miss Isabella McAlister Montgomerie, Lessnessnock, Ochiltree, Ayrshire.
John Ollerton Peet, Wimbrick Farm, Aughton, Lancashire.
John Steven, jun., Purroch Farm, Hurlford, Ayrshire.
Allan Stevenson, Parkhill, Craigie, Kilmarnock.
Miss Ellen Wright, Brentwood Mains, Galston, Ayrshire.

By Order of the Council,

ERNEST CLARKE

Secretary.

13 Hanover Square, W.
December 7, 1898.

REPORT OF EDUCATION COMMITTEE ON THE RESULTS OF THE EXAMINATION IN DAIRYING, 1898.

The Committee have the pleasure to report that the Third Annual Examination for the National Diploma in the Science and Practice of Dairying was conducted jointly by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland in September and October last.

2. The Examination for English candidates was held under the supervision of the Executive of this Society from September 26 to 30, 1898, at the Reading College and British Dairy Institute. The Examination for Scottish candidates was conducted on identical lines, but with different Examination Papers, at the Scottish Dairy Institute, Kilmarnock, from October 4 to 7, 1898, under the supervision of the Highland and Agricultural Society of Scotland. Delegates from each Society attended both Examinations.

3. Seventeen candidates entered for the Examination at Reading, and fifteen for the Examination at Kilmarnock, all of whom were examined.

4. Of the seventeen candidates examined at Reading, the following eleven have satisfied the Examiners, and will therefore be entitled to receive the National Diploma in the Science and Practice of Dairying:—

LAWRENCE ABRAM, Glebe Lane, Banks, Southport.
ALEXANDER SCOTT CROMAR, Midland Dairy Institute, Kingston Fields, Derby.
CHARLES WILLIAM TISDALE DAVIES, South Eastern Agricultural College, Wye, Kent.
ALFRED GEORGE EDWARDS, Dairy Institute, Worleston, Cheshire.
MISS S. BLANCHE J. FORRESTER, British Dairy Institute, Reading.
SAMUEL FRASER, Dairy Institute, Worleston, Cheshire.
MISS ELIZA JANE FREEMAN, Town Green, Aughton, Ormskirk.
WILLIAM NEWALL PLATT, Rodway Farm, Wellington, Salop.
ARTHUR MYERS SMITH, British Dairy Institute, Reading.
MISS CONSTANCE JESSIE SCULLY, Dairy Institute, Worleston, Cheshire.
RICHARD SQUIRE THORNE, British Dairy Institute, Reading.

5. Of the fifteen candidates examined at Kilmarnock, the following thirteen were successful:—

MISS SARAH S. ANDERSON, Hosenette Farm, Stonehouse, Lanarkshire.
MISS JANET CAMPBELL, 135 Wellington Street, Glasgow.
MISS JEANIE CARRUTHERS, Netherton, Auchenheath, Lanarkshire.
THOMAS HARRISON, Gilling's Creamery, Swindon, Wilts.
JOHN LESLIE, Kinninvie, Mannofield, Aberdeen.
WILSON MCMASTER, Challoch, Dunragit, Wigtownshire.
JOHN G. MCMILLAN, Fellnaw, Ringford, Kirkcudbrightshire.
JOHN MARCHBANK, Devonburn, Lesmahagow, Lanarkshire.
MISS ISABELLA MCALISTER MONTGOMERIE, Lessnessnock, Ochiltree, Ayrshire.
JOHN OLLERTON PEET, Wimbrick Farm, Aughton, Lancashire.
JOHN STEVEN, jun., Purroch Farm, Hurlford, Ayrshire.
ALLAN STEVENSON, Parkhill, Craigie, Kilmarnock.
MISS ELLEN WRIGHT, Brentwood Mains, Galston, Ayrshire.

6. The Examiner in Agricultural Chemistry at Reading reports that the Examination in this subject was "eminently of a satisfactory character, only one candidate out of the seventeen failing to pass. With few exceptions the candidates did not merely pass, but passed well, while in several instances the papers were of quite exceptional merit. Ten of the seventeen candidates obtained over two-thirds marks. The results of the Examination, so far as the subject of Agricultural Chemistry goes, seem to show that it is now recognised by the candidates that what is required in an examination of this class is a real knowledge of the subject, and intelligent expression of the same, and that nothing short of this will suffice. On the other hand, one may rightly reflect that such knowledge of the chemical principles of Dairying, combined with practical skill, such as the other parts of this Examination provide a test of, cannot fail to produce satisfactory results as regards the development and teaching of good scientific and practical Dairying."

7. One of the Examiners in Hard-pressed Cheese-making at Reading points out "the imperative need of a much longer course of practice and study for the Diploma than the large proportion of candidates seem to think is required." The Examiner in Veined or Blue-moulded Cheese-making at Reading presented a report on the candidates' methods of making Stilton Cheese, which has received the attention of the Committee. The Examiner in General Dairying, Butter- and Soft Cheese-making at both Reading and Kilmarnock reports that "taken all over, the practical work was performed in a creditable manner. Many of the students showed a weakness in their methods of expression throughout the written papers, while they exhibited a better knowledge in the oral examination. The capacity to impart instruction was weak, except in a few cases."

8. The thanks of the Royal Agricultural Society are again due to Mr. J. Marshall Dugdale, who personally superintended the Examination at Reading; to Mr. Martin J. Sutton, who kindly supervised the necessary local preparations for the Examination; and to Mr. Charles S. Mainwaring, who was present at the Kilmarnock Examination on behalf of the Royal Agricultural Society. Thanks are also due to the authorities of the Reading College, and to the Committee and Officials of the British Dairy Institute, for the excellent local arrangements with regard to the general conduct of the Examination, and the provision of milk, cream, and utensils.

MORETON,
Chairman.

November 1, 1898.

EXAMINATION IN THE SCIENCE AND PRACTICE OF DAIRYING, SEPTEMBER 26–30, 1898.

QUESTIONS IN GENERAL DAIRYING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

(*Three hours allowed.*)

N.B.—Nine questions at least must be attempted.

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1. Give a suitable rotation of crops for a farm of 120 acres of heavy soil. Take into account that two contracts have been entered into, one to sell sixty Imperial gallons of milk per day, and the other to purchase various feeding stuffs to the amount of 100*l* per annum. Name the district you have in view.

2. Construct one day's ration from food grown on above farm and supplemented by purchased feeding stuffs: (*a*) For cows in full milk in November; (*b*) For cows in full milk in March. Give your reasons fully.

3. Make out a statement showing approximate income, expenditure and profit on above farm, and amount of capital required.

4. What winter foods are liable to have an effect (good or bad) on the quality of milk or butter? State how you might obviate or lessen the bad effects.

5. Describe what you consider the best system of ventilation for a byre or cow-house, and how it can be controlled. What is meant by amount of air-space per cow, and about what amount do you think suitable? Explain why ventilation cannot fully make up for insufficient air-space.

6. Select one of the dairy breeds of cattle and mention the points of this breed which indicate milking characteristics. What are the principal differences between a feeding Shorthorn and a Jersey cow?

7. Describe fully the treatment of milk for butter-making from the time it leaves the cow-house till the cream is ready for churning, when the shallow pan is used for cream raising. State the advantages and disadvantages of using the shallow pans.

8. Describe and criticise any two methods in common use for testing the amount of butter-fat in milk.

9. What would you recommend as the best method of curing butter, so that it will keep for three months?

10. Give any two systems of ripening cream. Describe carefully all the changes that take place, and how you would control and determine your methods.

11. Describe the feeding and treatment of a heifer calf of any dairy breed from day of birth till two years old, where milk commands a high price.

12. What is "Husk" or "Hoose"? How and at what age does it usually affect cattle? Under what conditions would you expect to find it prevalent? Give its symptoms and treatment.

QUESTIONS IN AGRICULTURAL CHEMISTRY.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

(*Three hours allowed.*)

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1. How may the formation of milk in the cow's udder be accounted for? What different views have been held on this point?

2. Which are the nitrogenous constituents of milk? Distinguish between them in respect of their chemical composition and general properties, and

state, approximately, the amounts of each which are present in cow's milk of ordinary good quality.

3. Give examples to show how a knowledge of the action of fermentative processes may be essential to success in dairying, and instance how these processes may be controlled.

4. What appearances are presented by "ropy" milk? How is "ropiness" caused? In the event of its appearing in the mixed milk of a herd of cows, what would be the wisest course to pursue?

5. What circumstances would determine the amount of caseinous matter found in butter, and in what way would the butter be affected by the presence of a larger or smaller amount? What would be, approximately, a fair quantity to allow in well-made butter?

6. What are the circumstances which influence the rate of separation of the fat globules from milk? Give instances showing how these factors are made use of in different systems of cream separation.

7. What are the chief faults to which cheeses are subject, and to what causes may these be due?

QUESTIONS IN CHEESE-MAKING.

MAXIMUM NUMBER OF MARKS, 200. PASS NUMBER, 100.

(*Three hours allowed.*)

NOTE.—*In questions* 1, 5, 7, 10, *and* 12, *the answer may apply to either Cheddar or Cheshire Cheese, according to the variety with which the candidate is familiar.*

1. Give the size of, and the rooms needed for, a well-equipped *Cheddar* or *Cheshire* cheese dairy of fifty cows; and the essential requirements in them.

2. What are the surroundings in our homesteads that most generally interfere with the manufacture of fine cheese?

3. Does pure or impure water, to which cows may have access, affect the quality of the cheese; and if so, how?

4. Name the weeds, or other growths that cows may eat, which are deleterious in cheese-making.

5. What is the average weight of *Cheddar* or *Cheshire* cheese per cow, which should be produced in a cheese-making season; which breeds of cows are most adapted for cheese-making, and why?

6. Explain the use of rennet and salt in the making of cheese. Is it necessary to vary the quantities of either or both at any time during the season? Give your reasons.

7. Give the degree of acidity in the various stages of cheese-making (either *Cheshire* or *Cheddar*) of which you most approve. How do you test and arrive at same; and what is the effect of too high or too low a degree of it?

8. Describe the difference between the making of an early ripening and a long-keeping cheese.

9. What are the general characteristics of a badly made cheese either early or late ripening; and what are the chief causes of defects?

10. What are the component parts of a good *Cheshire* or *Cheddar* cheese; and what are the characteristics of either in their mature state?

11. Describe the treatment of cheese after vatting until matured; and what is the most approved temperature for ripening cheese?

12. Give a clear, concise description of your method of making either *Cheshire* or *Cheddar* cheese.

ANNUAL REPORT FOR 1898 OF THE CONSULTING CHEMIST.

THE principal feature of the year as regards the Chemical Department of the Society has been the separation of what may be called the "commercial" side from the "experimental" side of the Society's work. This has been consequent upon the erection and establishment of a new laboratory at the Woburn Experimental Farm in conjunction with a "pot-culture" station, devised primarily for carrying out the experiments contemplated under the terms of the Hills Bequest. With the institution of these experiments it became necessary not only to provide the "pot-culture" station, to which reference was made in last year's report, but to keep the experiments under constant and personal supervision, and to have immediately at hand a laboratory and other necessary accommodation for carrying on the chemical investigations arising out of the experiments. A very suitable laboratory, with store-room, &c., has now been equipped, and this and the pot-culture station have been put under the personal supervision of Mr. H. H. Mann, B.Sc., formerly my assistant in the Society's laboratory. Mr. Mann now resides at Woburn, and works under my immediate direction. The laboratory is now in full working order, and the experimental crops of the first season of the Hills and other experiments have been duly grown and reaped. By the aid of photography Mr. Mann has been able to preserve records of the most striking appearances presented in the different experiments, and these will be available for future publication in the Journal. In addition to the chemical work required for the pot experiments, the establishment of the new laboratory at Woburn has enabled the whole of the analytical work connected with the Woburn Field and Feeding Experiments to be conducted on the spot in the new laboratory. This has already proved a great convenience, enabling more representative samples of soils, manures, produce, &c., to be taken, and to be analysed with promptitude. Also it has facilitated the transference to and keeping at Woburn of all samples relating to the earlier years of the Woburn experiments, where they will at any time be available for reference. Further, by the setting-up, under the direction of the Meteorological Office, of a number of instruments for recording temperature, rainfall, wind, &c., the Woburn Farm has been constituted a Meteorological Station, and observations are daily taken by Mr. Mann and recorded, the returns being sent in monthly to the Meteorological Office. Together with these changes has come the transference to the Woburn laboratory of all matters connected with work of an experimental nature, included in which has been that in connection with the inquiries conducted by Mr. James Mason at Eynsham, Oxon.

This division of the Society's chemical work, which obviously

has considerable advantages, calls for a separate account of the Woburn and other experimental inquiries as distinguished from the analytical work conducted on behalf of Members of the Society in the Society's London laboratory, and under the special privileges enjoyed by them in respect of analyses of materials purchased for use by them on their own farms, and as regards other matters directly connected with their current farming operations. The present report deals with this latter class only—viz. the samples sent by Members in the ordinary course, and for which the usual fees have been paid to the Society.

During the twelve months under review (December 1, 1897, to November 30, 1898) 861 samples have been sent by Members in the ordinary course for analysis, this showing an increase of 23 over the number sent during the same period last year. The increase is, indeed, rather more than this, for included in the total of 838 for 1897 were 23 samples from Mr. James Mason, in connection with his Eynsham experiments, whereas those similarly sent by him during 1898 (43 in number) have been transferred to the Woburn Laboratory, and so are not included in the present total of 861. As usual, the analyses (18 in all) of samples of milk from cows competing in the Milking Tests at the Country Meeting of the Society (held this year at Birmingham) were made on the Show Ground by the laboratory staff.

I remarked last year upon the diminution in the number of samples of linseed cake submitted for analysis. This diminution has continued, the cause being, in all likelihood, the same as then pointed out—viz. the greater feeling of security among purchasers consequent upon a marked improvement in regard to the purity of linseed cakes on the market. This applies to all but the foreign-made cakes, many of which are not only impure but not infrequently also harmful to use, while, being sold without any guarantee as to purity, no security whatever is afforded. As regards English-made linseed cakes it is remarkable how great an improvement has been effected, and how much more care is exercised now, as compared with some ten years back, to screen properly the seed used. In this is seen abundant justification of the action of this Society when, in 1888 (Journal R.A.S.E., s.s. Vol. XXIV., Part I., April 1888), it set out what might be called a "standard" for "pure linseed cake.' I well remember how it was said at the time, pretty generally, that the standard was too high; but, as events have proved, there has not been, with the exercise of due care, the least difficulty among our leading makers to comply with the Society's requirements as then laid down by me, and it is indeed quite exceptional now—with English-made cakes at least—to find linseed cake of impure or even of questionable purity. Simultaneously with these changes, I have noted with satisfaction the increasing tendency, both among makers and purchasers, to abandon the use of the objectionable term "95 per cent." as applied to linseed cakes (meaning cakes made from seed of 95 per cent. purity), and to speak of "pure linseed cake" or simply

"linseed cake," this latter term implying that the cake shall be "pure."

But while I have said this as regards the *purity* of linseed cakes, the instances before me of cakes which have fallen, in respect of quality, below the guarantees of oil percentage, &c., given at the time of purchase, afford by no means justification for the smaller number of samples submitted. Hence, while to a considerable extent the need of exercising special care as to purity, and of checking this by chemical examination, has diminished, it is as necessary as ever to check samples as to their quality.

Cotton cakes have been, on the whole, good, and made from better-cleaned seed than was the case a year or two ago.

In manures generally the number of samples sent has been much the same as last year, except that there has been a considerable increase in respect of Peruvian guano, the favourable prices at which this material can now be obtained inducing its more extended use, the cheaper and more distinctly phosphatic kinds not unfrequently being used in place of superphosphate. Basic slag evidently continues to be extensively employed, and, both in respect of quality and fineness of grinding, samples have been, as a rule, satisfactory, though in not by any means few instances not coming fully up to the guarantee given with them.

In some purchases of manure under the name "dissolved bones," there has been found to be present admixture of *boiled* bone. Samples of nitrate of soda have been very free from adulteration, so also have those of sulphate of ammonia.

The decrease in the number of soils sent for analysis is apparent rather than real, and arises from the fact of those sent by Mr. James Mason being included in the 1897 return, while none are comprised in the total for 1898. An increasing number of waters has this year been reported upon.

While in no way implying that the experience of the past year has been any otherwise than to show the continued usefulness of the Society's laboratory and the advantages that the Members of the Society gain by submitting regularly samples of their purchases for analysis, and seeking advice in respect of them, I nevertheless feel bound in fairness to the manufacturing trade, alike in cakes and manures, to pay a tribute to the excellence of the supply, as a whole, of these materials to the farmer, and to the low prices at which they are obtainable.

I have noted from time to time, as they have occurred, instances in which adulteration or misrepresentation of fertilisers or feeding-stuffs has taken place. These have been duly recorded in the Reports of the Monthly Council Meetings of the Society, together with useful hints as to the purchase and use of different materials offered to the farmer. It had been felt that the publication of these notes *at the time* would be more useful generally than if they were kept over until the issue of this my Annual Report. It will, accordingly, be only necessary to refer briefly to the more important of these.

A. Feeding Stuffs.

1. *Linseed Cakes.*

Hardly an instance has occurred in which English-made cakes have been found to be impure, and but few samples of home manufacture and described as "oil-cake" have been sent. Fifty per cent. of the cakes showed over 12 per cent. of oil, and 24 per cent. under 10 per cent. of oil.

But foreign-made cakes, more particularly "Russians," were frequently found to be unsatisfactory, owing either to excess of weeds, seeds, or sand, or to containing harmful ingredients such as mustard-seed, or horsehair, rope-sacking, &c., from the bags in which these cakes are often roughly pressed. A sample of 10 tons invoiced as "selected Russians," at 6*l.* 12*s.* 6*d.* per ton, carriage extra, and purchased in Sheffield, gave on analysis :—

Sand . . . . 6·38 per cent.

In another purchase of "Russian cake" the sample sent for analysis showed :—

Sand . . . . 4·00 per cent.

A foreign-made cake, very hard-pressed in horsehair bags, gave :—

Oil . . . . 7·91 per cent.

and was a dangerous cake to use on account of the quantity of horsehair scattered throughout it.

A delivery sold as "Indian oil cake" was in bad, sour condition, and contained not only mustard seed, along with polygonum and other weed seeds, but had, both on the outside and running through the middle of it, pieces of rope and string, derived probably from the sacking in which it had been pressed. In this case one bullock which had been feeding on the cake had died, and three others were taken ill with violent inflammation of the bowels.

2. *Linseed and Linseed Meal.*

Samples of linseed used for feeding purposes gave respectively 34, 37, and 39·4 per cent. of oil. In the first-named case the impurities amounted to 3·45 per cent., in the last to 5·72 per cent.

Attention was called by me, in my periodical reports, to the sale, under the name "Linseed Meal," of a parcel of ground-up linseed cake, which contained from 6 to 7 per cent. of oil only as compared with the 35 per cent. or so which it would have contained had the meal been what one would suppose it to have been, viz., linseed simply ground into meal.

3. *Cotton Cakes.*

Undecorticated cotton cakes have been generally made from well-cleaned seed. Occasionally, however, the percentage of sand in

these cakes has run too high. In one instance a sample of cotton cake was noticed to have a distinctly salty taste: nearly half per cent. of salt was found in it, and the cake or the seed from which it was made had probably been sea-damaged. The excuse made by the vendors was that "their coppers were washed with salt water, as they found it helped to preserve the cake from mould"!

In decorticated cotton cakes the greater number of samples gave below 10 per cent. of oil, and there have been but few first-class rich and soft cakes sent to me.

4. *Maize Germ.*

I gave in my Annual Report for 1897 analyses of some samples of "Maize Germ," as now generally manufactured. It is necessary, however, to point out that under this term is sometimes sold, and at the same price as genuine maize germ (about 4*l.* 10*s.* per ton), an article which really consists merely of the husks or skin of maize, and is a much inferior feeding material.

5. *Coffee Husks.*

The husk or "parchment" skin of the coffee berry, which envelops the berry after the fleshy pericarp has been removed by the washing and macerating processes to which the fruit is subjected on the estates where the coffee is grown, and which in turn is removed by hand before the coffee is roasted, has hitherto been rightly looked upon as useless for feeding purposes. Lately, however, it appears to have been introduced as a convenient component of certain of those frequently very "doubtful" articles known as "compound" or "feeding" cakes. I have also had before me an instance of the direct sale of the material by itself as a feeding substance. The composition is represented by the following analysis:—

Moisture	10·78
Oil	·90
[1] Nitrogenous constituents	3·88
Digestible fibre, &c.	25·71
Woody fibre	57·63
Mineral matter (ash)	1·10
	100·00
[1] containing nitrogen	·62

This was sold at 20*s.* per ton, but is quite worthless and unsuitable for feeding purposes. The microscopical appearances presented by coffee husks are distinctive, and somewhat resemble those of earthnut.

6. "*Smutter Dust.*"

What this name is really meant to imply I do not know, but, judging from a sample sent to me under that description, and the price of which was stated to be 25*s.* per ton, I should call it nothing but "sweepings." There were in it husks of oat, wheat, and barley,

with chaff, refuse grain, weed seeds, &c. Analysis of it showed 8·86 per cent. of sand. It is astonishing how people can think of using such rubbish for feeding to stock, and still more how they can pay 25*s.* a ton for it.

7. "*Pig Food.*"

Anything, it is popularly supposed, is good enough for a pig to eat, but when a price of 6*l.* per ton is charged, one may fairly expect to get something more suitable as a general food for pigs than the material of which the following was the analysis:—

Moisture	6·99
Extractive matter in ether	2·07
[1] Albuminous compounds	7·91
[2] Sugar, starch, &c.	81·03
Indigestible fibre	·50
Mineral matter (ash)	1·50
	100·00
[1] containing nitrogen	1·26
[2] including cane sugar	41·25

There is nothing so very wrong, so far as the analytical figures go (with the exception of the large proportion of cane sugar), had these but been derived from suitable materials. But the "pig food" was, as a matter of fact, nothing but sweepings of some confectionery establishment, and consisted of about one-half sugar icings and coloured sweetmeats, and one-half bread-crumbs, pieces of bread, crust, &c. Fifty per cent. of it was soluble in water, and it is out of the question to think that such a mixture would either form a suitable general food by itself, and still less that it could be economically used, however much the pigs might show a liking for it. The price of sugar is, unfortunately for our colonies, far too low at present to make it worth one's while to pay 6*l.* a ton for sugar sweepings and bread crumbs.

B. Fertilisers.

1. *Superphosphate.*

This most generally used fertiliser has again been within easy reach of the farmer; its condition and quality have alike been well maintained, and the lowest percentage of "soluble phosphate" in any sample sent me during the year has been 21·79 per cent. An instance of superphosphate being sold very cheaply was a purchase of six tons at 51*s.* 6*d.* per ton delivered for cash payment. The analysis gave 31·76 per cent. of "soluble phosphate," which works out to 1*s.* 7*d.* per unit only of "soluble phosphate."

2. *Dissolved Bones.*

I have occasion to impress again what I have frequently given a warning about before, viz., that when a fertiliser is sold under the name "dissolved bones," it must be made from *raw* bone and acid,

and not from *boiled* bone or with admixture of that material. The difference between the two fertilisers is well illustrated by the following case in which a member of the Society sent me for analysis two samples of what he had in each case purchased as "pure dissolved bones." The "Newton" delivery cost 4*l.* 5*s.* per ton, the "Lincoln" one 4*l.* 10*s.* per ton. The analyses came out :—

	"Newton," £4 5 per ton.	"Lincoln," £4 10 per ton.
Moisture	14·96	10·46
[1] Organic matter, water of combination, &c.	23·81	29·97
Monobasic phosphate of lime	11·43	7·79
equal to "soluble phosphate"	(17·90)	(12·20)
Insoluble phosphates	9·99	25·25
Sulphate of lime, &c.	34·66	24·34
Sand	5·15	2·19
	100·00	100·00
[1] containing nitrogen	1·33	2·92
equal to ammonia	1·62	3·55

The "Lincoln" sample was genuine dissolved bones, and was worth nearly 30*s.* a ton more than the "Newton" one, this latter being made largely from *boiled* and *not* raw bone.

3. *Bone Meal.*

"Steamed" or "boiled" bone is, at times, sold to farmers under the name "bone meal." A member of the Society purchasing 10 tons of bone meal at the price of 4*l.* 10*s.* per ton delivered had sent to him what was really "steamed bone," the analysis of a sample showing :—

Moisture	14·07
[1] Organic matter	16·07
Phosphate of lime	58·13
Carbonate of lime, &c.	9·54
Sand	2·19
	100·00
[1] containing nitrogen	1·41
equal to ammonia	1·70

The vendors subsequently wrote "The bones are steamed to extract the fatty matter, and they are then ground into meal." As the purchaser had only had 2 tons delivered, he paid for these and threw the remainder on the vendors' hands, pointing out that he could get steamed bone meal for 3*l.* 15*s.* per ton. Raw bone meal would have contained quite 4½ per cent. of ammonia.

4. *Steamed Bone Flour.*

Care must be exercised also in the purchase of steamed bone flour, by reason of the introduction from abroad of a material

produced by the treatment of bone with sulphurous acid, for the purpose of extracting from it a less deeply coloured glue and size than usual. This "patent process" leaves, however, a certain, and often considerable, amount of *sulphite* of lime in the bone flour, and if the latter be mixed with other manurial materials, evolution of sulphurous acid, recognisable by its stifling odour, may not unfrequently result, as also loss of fertilising constituents, and even loss of crop. So long as this is sold under a description that will clearly imply what it is, well and good, but it must not be sold as ordinary "steamed bone flour," as was the case in an instance now before me, the vendor's letter stating, "We confirm sale to you of 5 tons of steamed bone flour subject to the undermentioned guarantee, and at 4*l*. per ton net cash, carriage paid," the guarantee in question being, "guaranteed nitrogen equal to 1½ per cent. ammonia, 60 per cent. phosphates."

5. *Peruvian Guano.*

The samples sent have mostly been of the more phosphatic kind. In the case of one very cheap purchase of this class the sample gave on analyis :—

Phosphate of lime	70·50 per cent.
Ammonia	2·64 „

and the price, on rail, was 4*l*. 15*s*. per ton only. Occasionally, highly ammoniacal samples of Peruvian guano are still met with; one I analysed gave over 12 per cent. of ammonia, and others 11·6, 10·7, and 8⅓ per cent. of ammonia. There can be no question as to the advantage of purchasing Peruvian guano when at its present much lowered price. At the same time it is well to point out that care must be taken in obtaining with every purchase a guarantee of the quality of the delivery in question. The "official analysis" of every cargo of Peruvian guano that arrives in this country is made and guaranteed by the importers. But when these cargoes find their way into the hands of other firms who purchase portions and retail them out, it is not unusual to find another analysis, which is perhaps more favourable than the proper "official analysis," put forward in place of the latter, and unless the purchaser takes care either to have this higher analysis definitely guaranteed to him as regards the particular delivery to him, or insists upon having the "official analysis" of the cargo, he is likely to find himself misled and without remedy in case of deficiency occurring.

6. *Basic Slag.*

In the early part of the year a number of cases came before me in which basic slag was supplied of quality or of fineness inferior to that guaranteed. Indeed, so great was the "rush" to obtain this cheap and also useful fertiliser that it could not be turned out

sufficiently quickly to meet demands. Deficiencies were, of course, promptly made allowance for, but it is necessary to point out the necessity that exists for checking all purchases by analysis.

As an instance of the variability of quality and price may be mentioned the case of one member of the Society who submitted three samples at the same time to me for analysis. The results and relative prices were :—

	1	2	3
Percentage of phosphoric acid . .	22·96	18·53	15·13
equal to phosphate of lime . .	50·12	40·45	33·08
Percentage of fineness . . .	90	91	80·6
Price per ton, delivered . . .	38*s.*	34*s.*	33*s.*

Of all the samples sent me there were only 11 that gave less than 80 per cent. "fineness" of grinding, and purchasers should insist upon this percentage in future.

7. *Common Slag.*

There still crop up from time to time instances of materials which are not "basic" slag, but merely common blast furnace slag or the like, and worthless for fertilising purposes, taking advantage of the popularity of basic slag, and being passed off in its place. Farmers and also agricultural chemists cannot be too careful to keep to the use of the term "Basic slag" and not to get into the way of speaking loosely of "slag," as if that were equivalent to "Basic slag."

8. *Miscellaneous Fertilisers.*

(*a*) Gun wad waste.
(*b*) Leather powder.
(*c*) Rag dust.
(*d*) Silicate manure.

There frequently come into use out-of-the-way materials, many of which are purchased by hop-growers with the object of supplying nitrogen in the form of slowly acting nitrogenous organic matter. Such are the following :—

	(*a*)	(*b*)		(*c*)
	Gun wad waste, per cent.	Leather powder, per cent.	Calcined leather powder, per cent.	Rag dust, per cent.
Nitrogen . . .	6·69	5·86	7·63	4·33
equal to ammonia	8·13	7·11	9·26	5·25
Sand . . .	—	—	4·01	24·72

(*a*) The price of the gun wad waste was 2*l.* 14*s.* per ton on rail in London. It consisted of the clippings of felt left after the cartridge wads had been cut out. Considering the condition and difficulty of applying the material, the price was certainly too much.

(*b*) The leather powder seemed to be wash-leather waste. It cost 3*l.* 15*s.* per ton, and was much too dear. It contained a quantity of carbonate of lime also.

The calcined leather powder was to cost 8*s.* 6*d.* per unit of ammonia, but it was found that very little indeed of the ammonia was present in an available condition.

(*c*) The rag dust cost 43*s.* per ton, and had to be carted three miles. It, too, was distinctly dear. About one quarter of it was sand and dirt.

(*d*) The "Patent Silicate Manure" still seems to find a certain number of customers at the price of 8*l.* per ton. Its mode of manufacture is stated to be a "secret," and its virtues are such as are not discoverable by the ordinary methods of chemical analysis. In the case of a sample sent me not long since by a member I obtained the following results :—

Moisture	6·65
Water of combination, and [1] ammonia salts	7·01
Oxide of iron and alumina	2·40
[2] Phosphoric acid	·16
Lime	8·38
Sulphuric acid, magnesia, alkalies, &c.	14·00
Insoluble siliceous matter	61·31
	100·00
[1] containing nitrogen	1·47
equal to ammonia	1·78
[2] equal to phosphate of lime	·35

The above analysis, at all events, has failed to bring out anything which would have a value in the least approaching 8*l.* per ton.

C. Waters.

A considerable number of these has been reported on during the year. Many of the analyses have shown the presence of polluting sources in close vicinity to the supplies. In some cases waters of distinctly peculiar natural composition have been met with, of which the following is an instance. The analysis showed *inter alia* the subjoined results :—

	Grains per gallon.
Total solid residue	289·52
Chlorine	94·38
equal to chloride of sodium (common salt)	155·52
Nitrates	none

This water came from Kempston, near Bedford, and from the Oxford Clay. Sulphates of lime and magnesia formed, along with common salt, a considerable part of the solid constituents, and such a supply is practically an impossible one to use.

The following is the List of Analyses made for Members of the

Society for the twelve months December 1, 1897, to November 30, 1898.

Linseed cakes	110
Undecorticated cotton cakes	34
Decorticated cotton cakes	32
Compound feeding cakes and meals	48
Rice meals	3
Cereals	8
Dried grains	1
Superphosphates	70
Dissolved bones and compound artificial manures	38
Bone meal and boiled bones	44
Peruvian guano	30
Fish and meat guanos	25
Basic slag	72
Nitrate of soda	20
Sulphate of ammonia	17
Potash salts	8
Salt	1
Shoddy	28
Hoofs and horns	2
Soot	1
Rape dust and manure cakes	2
Limestone	2
Creosote	1
Butter, milk, and cream	24
Waters	160
Soils	27
Miscellaneous	35
Total	801

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ANNUAL REPORT FOR 1898 OF THE CONSULTING BOTANIST.

DURING the past year 294 inquiries have been answered on behalf of the Members of the Society. Of these, 48 dealt with diseases of plants, 5 with plants causing injury to stock, 52 with weeds, and 163 with the purity and germination of seeds. The remaining 26 applications were of so miscellaneous a character that they cannot be classified.

Samples of wheat injured by four different fungi have been received: three specimens from Herts, Lincoln, and a locality not mentioned were attacked by *Scolecotrichum Graminis*, which shows itself in small dark-brown spots on the stem, chaff, and ears of the corn. It is not many years since it was first detected injuring our crops, and having got a place it seems to be extending.

It, of course, appropriates to itself the food which is being transmitted to the seed, but it is not so injurious as mildew. *Erysiphe Graminis*, a mould that attacks wheat, was sent me from Bedfordshire, and was observed by me in other places. It appears to be greatly encouraged in wheat that is growing luxuriantly from an abundance of rain or from the use of a nitrogenous manure. It has caused serious injury to crops, but no definite information exists as to the extent of this in Britain. It is not an infrequent fungus. Sprinkling with the "flowers of sulphur" may be useful, if applied in the early stages of the attack. The seed treatment of a smutted crop, proposed to be used for seed, was communicated to a member. A field of early spring wheat in Herefordshire, promised well, tillering thickly all over the field, but never matured, the ear not filling; this was found to be due to the mycelium of a fungus which penetrates the straw just above the root and prevents the passage up of the sap. The fruit of this fungus has not been observed, and it is known only as "straw-blight." Nothing can save the plants after they are attacked, as the fungus lives inside the stem.

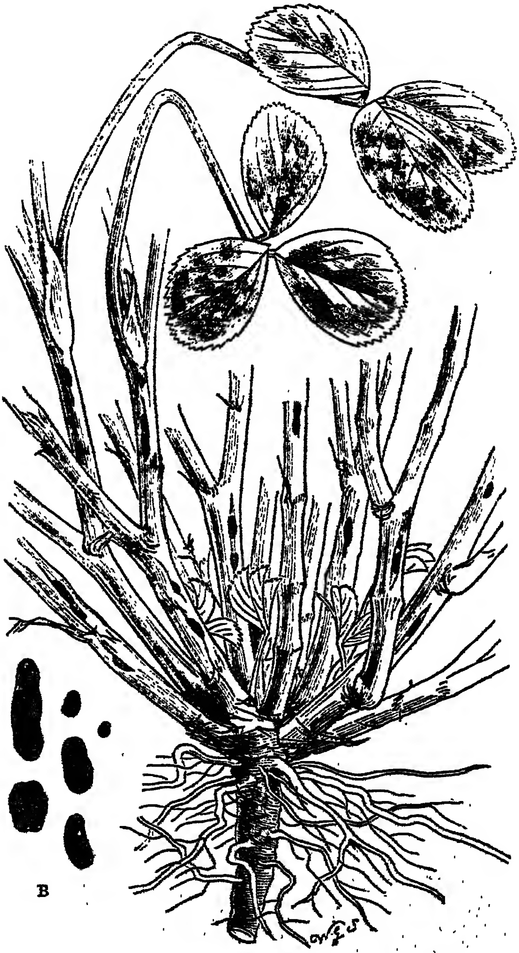
In Lincolnshire a field of barley was seriously attacked by *Helminthosporium gramineum*. The leaves and stem show dark-coloured lines produced by the fungus It steals some of the food prepared for the grain, but does not seriously affect the harvest. Another field of barley was arrested in its growth, and had the appearance of being attacked with straw-blight, but there was no mycelium in the straw. The roots had been destroyed, by what agency could not be determined from the specimens submitted, and I was unable to obtain further specimens.

Specimens of diseased grass from Devonshire were sent, which had been attacked by the same fungus that causes mildew in wheat. It was, when I received it, in the red rust stage of its life. Brome grass from Derbyshire was attacked by a smut which is found only on this grass. It is called *Ustilago bromivora*. The seeds are, as in the wheat and other smuts, converted into a mass of brown powdery spores.

Red clover has during the past year suffered from the attacks of two different parasites. Plants from Lincolnshire were destroyed by *Peronospora Trifoliorum*; but the most serious enemy it has encountered is one that has not been long observed in England, *Sclerotinia Trifoliorum*. Besides producing spores for spreading the fungus, this parasite develops within the tissues of the clover small dark bodies of hardened mycelium, which produce in the following season small stalked heads in which numerous spores are borne in minute oval sacs. The plant is attacked on the leaf and from it the mycelium passes down into the stem. The small hard bodies are formed in the interior of the stem, but they sometimes grow to such a size that they burst through the skin and appear on the surface. In many districts the clover was almost completely destroyed by this fungus. I have received specimens from the counties of Kent, Surrey, Gloucester, Stafford, Derby, Leicester,

Northampton, and Hertford, and from different localities in several of these counties.

The only thing that can be done is to refrain from growing



Red clover destroyed by the parasitic fungus *Sclerotinia Trifoliorum*. The fungus having reached the stem develops in it small dark masses of hardened mycelium called sclerotia. The sclerotia that grow to any size frequently burst the skin and protrude. Their presence, though not seen, may be detected by pressing the decaying stem between the finger and thumb, when it will be found that these hard bodies do not yield to the pressure.—B., separate sclerotia, natural size.

clover for several years on fields where the fungus has appeared. It is to be feared that having got such a hold in the country it is likely to remain with us. Red clover is not the only leguminous

plant that suffers from the *Sclerotinia*. From Norwich and Hertford I have received trefoil (*Medicago lupulina*) very badly infected. Indeed, Rostrup, who has carefully studied the fungus and its hosts, has observed it to be more frequent and more severe on the trefoil than on clover. And from two localities in Kent and one in Surrey I have received specimens of sainfoin (*Onobrychis sativa*) in which it was growing with great vigour.

Diseased trefoil was sent to me from Kent, which had been attacked by the conidial state of *Phyllachora Trifolii*. This parasite shows itself in round dark spots on the leaf, then the spores appear borne on beaded stalks. The part attacked is killed, and the fungus spreads in the interior of the trefoil and destroys the whole plant. The cultivation of clover must be omitted for several years in any field where this fungus appears. A good dressing of lime would help to destroy the germinating spores.

The bean crop was in several places seriously injured by a severe attack of the fungus *Uromyces Fabæ*, which so completely took possession of the plant that the flowers were killed, the beans which had begun to form were arrested in their progress, and the crop was a failure. Samples of very diseased plants were received from Kent, Sussex, Essex, and Gloucester. If this attack were observed in its early stage, spraying with a solution of sulphate of copper would probably arrest the progress of the disease.

I have examined samples of "Finger-and-toe" in turnips, but I specially refer to this disease that I may point out that irregular swellings on the rootlets of the turnip and cabbage have been forwarded to me as this disease. They are, however, galls caused by the larvæ of *Ceutorrhynchus sulcicollis*, as Mr. Warburton informs me (see p. 758). They may at once be distinguished from "Finger-and-toe"; when cut open, the burrows of the larva, if not the larva itself, will be found in the gall.

In the end of last year I received some mangels which were seriously affected by a parasitic fungus. I was then unable to determine what the fungus was, as I failed to get it to produce its spores. The mangels were sent to me from Devon. I have this autumn obtained from Surrey mangels attacked by the same disease, and one of them showed the fungus in fruit. The fungus has been known for six or eight years in Denmark, and was described by Professor Frank, of Berlin, in 1893. He gave it the name of *Phoma Betæ*.[1] It has attacked the sugar-beet in Germany and Denmark, and may seriously affect the large industry connected with the cultivation of the beet and the manufacture of beet-sugar. The mangel is attacked first in the leaves, and the mycelium passes down into the root. It was noticed in the end of August and the beginning of September that the leaves in the parts of the field where afterwards the roots were destroyed were dark and

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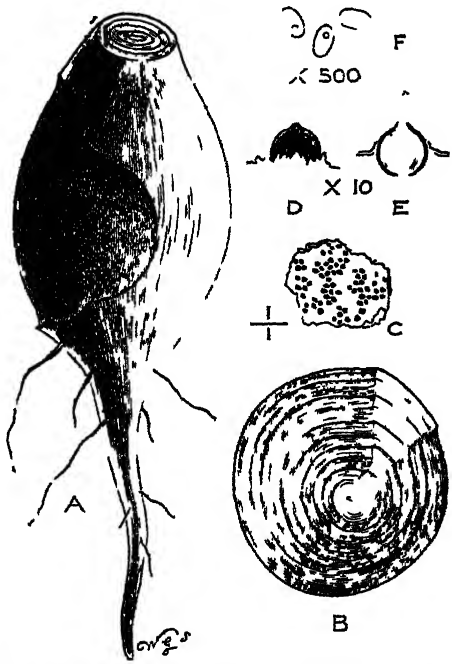
[1] See "Observations on *Phoma Betæ* (Frank), a Fungus that injures Mangel." By Edmond J. McWeeney, M.A., M.D. Journal R.A.S.E., vol. vi., 3rd series, 1895, p. 563.

went off dead No doubt this was the beginning of the attack. Should the disease appear again, it would certainly be desirable to spray with the Bordeaux mixture, so as to prevent the growth of the mycelium sent out from the spore when it germinates. The mangels reached me after they were taken up to be stored for the winter. About a third of the crop was ruined. It was easy to trace the mycelium up through the root to the bases of the leaves which had been removed. The fungus had spread through nearly the whole of the root, and, with the help of other parasites that followed it, converted it into a black fœtid mass deprived of all nutriment. Externally the skin is darkened and the substance of the root shrinks. From the contraction of the tissues a great rent is made in the worst roots.



Mangel destroyed by *Phoma Betae*, a parasitic fungus. Externally the skin is darkened and somewhat depressed. B Transverse section showing in the light portion the only part of this root which was not destroyed by the fungus.—C Portion of the skin of the root with the pustules of the fungus in which the spores are produced, natural size.—D One of the pustules magnified.—E The spores escaping by the pore at the apex.—F Separate spores highly magnified.

This dangerous enemy of the mangel has got into the country. In Devon and Surrey, as I have said, it has appeared, and Professor Malden, of Uckfield College, Kent, has recently (*Farmer's Gazette*, Nov. 5, 1898) noted its occurrence in his neighbourhood. If it be possible to arrest its progress, everything should be done to secure this end. The diseased tubers are useless for food. They should be collected, as well as the diseased leaves, put into pits or made into heaps, and lime or sulphate of copper should be liberally applied throughout the mass. To leave the diseased leaves or roots in the field is to encourage the production of spores, which appear in immense quantities where the fungus develops its fructification. The sowing of mangel in a field where the disease has appeared must be avoided for several years. If the disease makes its appearance

next year, the plants should be sprinkled, as I have said, with Bordeaux mixture. It will be dangerous to store any roots from a diseased part of the field, for the mycelium continues to grow, and would infect healthy roots. I cut a diseased root, which had a narrow healthy portion running from the skin to the centre, into many sections, about an eighth of an inch thick, and put them in blotting-paper under heavy pressure, with the view of preserving them to show the extent of the injury when the root was cut. The paper was frequently changed, but in little more than a week the fungus had invaded the healthy portion and completely destroyed it. This *Phoma* appears to be more rapidly and completely destructive to the mangel than the *Phytophthora* is to the potato.

From Merionethshire I had specimens of *Æcidium Grossulariæ*, which is not an uncommon fungus on the leaves and fruit of the gooseberry. This is one stage in the life of a parasite, like that which the mildew of wheat (*Puccinia Graminis*) passes on the barberry. The various stages in the life of the gooseberry parasite have not yet been observed, though it is believed that this on the gooseberry is the æcidial stage of a *Puccinia* which lives on a sedge (*Carex*).

Several oaks were examined that had been attacked by *Polyporus dryadeus*, a fungus which finds its way into the inner wood of the tree, and, obtaining its food from the wood, makes it white and rotten. It throws out on the surface of the trunk its fructification, which is hard and brown above, and has underneath a layer of fine tubes in which the spores are produced. A tree cannot long survive a serious attack of this fungus; no external application will arrest its progress.

The *Dasyscypha Willkommii*, which causes the canker in larch, was found in abundance in a plantation where it was thought to be unimportant, and caused by stray shots in rabbit shooting (see Journal, 3rd Series, Vol. II., 1891, p. 299).

From Cornwall specimens of an iris were received which had been attacked by *Helminthosporium gracile*.

II.—Injury to Animals.

An account of the injury to cattle and sheep from eating Water Dropwort (*Œnanthe crocata*), and to horses from Dog's Mercury (*Mercurialis perennis*), has been published in the last number of the Journal, this volume, p. 561. The other cases of injury to cattle seem not to have been due to the food they were eating.

III.—Names and Properties of Unknown Plants.

The inquiries for the names of plants and their properties chiefly referred to grasses and weeds in pastures; none require to be specially referred to.

IV.—Purity and Germination of Seeds.

The seeds of all kinds examined during the past year have been remarkable for their purity. The clovers have been free from dodder, and the grasses have been almost free from the seeds of agrostis, holcus, and other weeds which are undesirable in a pasture. The germination has also been good, though in nearly all the kinds samples of low germination have been tested. It is obvious that a failure of 20 per cent., or even 10 per cent., in germination adds considerably to the cost of any kind of grass. The results of the tests for germination of the seeds during the year are exhibited in the following table. Those only are mentioned of which a sufficient number were tested to give a trustworthy result :—

Grasses.

—	Mean percent	Highest per cent.	Cost per lb.	Lowest percent	Cost per lb.
			s. *d.*		*s* *d.*
Meadow Fescue	91	99	0 7	80	0 8
Meadow Foxtail	54	63	1 6	42	1 9½
Rough-stalked Meadow Grass. .	64	85	1 6	31	2 1
Cocksfoot.	75	95	0 10½	47	1 2
Timothy	87	100	0 5	58	0 6½
Hard Fescue	69	87	0 9	56	0 11½
Tall Fescue	72	79	0 11	68	1 0¼
Perennial Rye-grass . . .	88	95	0 2¼	75	0 3
Italian Rye-grass	70	83	0 3	52	0 3¼
Clovers					
White Clover	91	99	1 0	75	1 2¼
Alsike	93	99	0 10½	70	1 1
Red Clover	89	99	0 9	73	0 11

Germination of Grasses and Clovers during the Past Year.

I have added the prices from a seed merchant's catalogue for last year of a pound of these grasses and clovers, taking the cost of the best quality of seed, and have calculated at the same rate the price paid for an equal number of germinating seeds as found in the best samples examined. It will be seen from these figures that, to secure the same number of growing seeds, the purchasers of the inferior quality had to pay 2*s.* 4½*d.* more for a pound of each of the above grasses and clovers, or 12 lb. in all, than the purchasers of the better quality.

During the month of July I visited the twenty-four plots which are under experiment in various parts of England, with the view of improving poor pastures, and prepared a report on the state of the pastures, at the time of my visit, for the Chemical Committee.

William Carruthers.

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ANNUAL REPORT FOR 1898 OF THE ZOOLOGIST.

Introduction.

The exceptional weather of the past summer has naturally had a marked influence on insect attacks. To judge from the applications received by the Zoologist, that influence has chiefly been manifested by a large increase in various caterpillar pests, and by unusually violent attacks by certain species of aphis or green-fly. Some of these attacks have been locally serious, and have caused considerable loss; but it would nevertheless be a mistake to attribute to them an undue importance, when the likelihood of their recurrence to the same extent for many years is very small.

Of the ordinary corn pests very few complaints have been received, the wheat bulb-fly alone having been the subject of more than two inquiries. Insects injuring grass roots, such as chafer and crane-fly grubs, have not been so frequently reported as during the last two or three years, but this is very probably because the general injury caused by the drought has masked the less obvious insect injury.

In the autumn of 1897 some Devonshire apples gave rise to the fear that a serious American apple pest had established itself in this country. Fortunately the insect at work in Devonshire proves not to be the "apple maggot" of the States, but the caterpillar of a small moth. It is a new or hitherto overlooked pest in England, and therefore of interest, though fortunately not likely to prove very formidable.

The Cabbage and Turnip Gall Weevil.

Ceutorhynchus sulcicollis.

The work of this beetle bears so close a resemblance to Anbury, or "Finger and Toe," that it is constantly being mistaken for that disease. The plants infested exhibit knots and swellings on the roots very much like those caused by the fungus; but though the latter requires a microscope to reveal its presence, the question of weevil attack may be at once settled by simply opening some of the galls, and looking for the characteristic brown-headed, legless grubs, about a sixth of an inch or less in length.

With regard to this insect, a case was reported during the past year of particular interest to farmers. A member of the Society purchased and planted a number of infested cabbage plants without observing their diseased condition, and the crop naturally failed. Nor was this the whole measure of his loss; for when the weakening of the plants led to an investigation of the cause, it was found that many of the grubs had left the roots to pupate in the ground, so that the farmer had been unfortunate enough not only to plant (and pay for) a worthless crop, but to import into his land a pest which it may

not be very easy to eradicate. This shows how necessary it is to examine plants for disease before putting them in.

The larvæ pass the winter in the roots, and emerge in the spring. The plants in question were put in in the beginning of May, when they probably still retained some of the insects.

Rotation of crops, and the avoidance for a time of such as are of the turnip and cabbage tribe, is the best treatment of this disease. This will be of little use, however, if cruciferous weeds, and especially charlock, are allowed to thrive; for in the roots of such weeds the weevil is perpetuated. Infested roots should be consumed early, before the grubs emerge to turn to pupæ in the ground. If this emergence has been permitted, and the ground is infested with the pest, it is advisable to give it a dressing of gas-lime.

Pea and Clover Weevils.

Sitones lineatus; S. crinitus.

These small beetles, which are familiar pests in pea, bean, and clover crops, often do great harm by devouring the leaves of those plants. Their work is very characteristic in its earlier stage, for the leaves of the plants they infest are notched or scalloped round the edge.

The grub is seldom observed in large numbers, and indeed nothing was known about it till the year 1882, when it was found devouring pea roots.

Last spring the larvæ were remarkably plentiful at the roots of clover crops, and several applications were received with regard to them. They are fleshy white grubs of the ordinary weevil type, legless and wrinkled, brown-headed, and tapering somewhat towards either end. They attain a quarter of an inch in length.

It was difficult to judge the extent of the injury inflicted by the grubs, for almost all the crops they infested were also attacked by a much more destructive fungoid pest, *Sclerotinia Trifoliorum*, referred to in the report of the Consulting Botanist (p. 752), and to this was probably due in most cases the failure of the crop.

Nevertheless the weevil grubs had left the marks of their jaws on the roots, and they are doubtless capable of working much harm, as is known to be the case with many other species of the tribe. No report has been received of the occurrence of the beetles in especially large numbers during the summer.

Where the weevil grubs are found to be present there is probably no better treatment than the speedy application of some stimulating manure.

"Clay-coloured" Weevil in Hops.

Otiorrhynchus picipes.

In March I received from Worcestershire some hop-roots infested by grubs which were evidently those of some weevil.

Specimens were bred out, and the pest proved to be the "clay-coloured" weevil, *Otiorrhynchus picipes*, an insect not very particular as to its food, but usually associated with raspberry infestation.

I could only find one previous record of its attack on hops, Mr. Whitehead having found it plentiful in the hop gardens of East Kent in 1894.

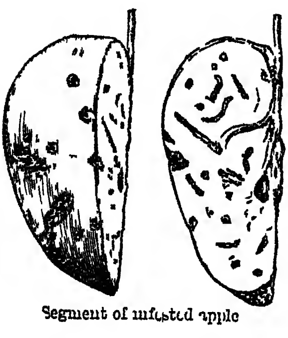
The insect is a somewhat large weevil, being rather more than a quarter of an inch in length. The yellow scales with which it is thickly covered give it a clay-like hue, rubbed specimens having a much darker appearance. In its mature state it attacks the leaf-stalks, causing the leaves to wither or fall, and thus doing much injury to the plant. The eggs are laid in the summer, and the grubs feed in the ground until the following April, when they change to pupæ, from which the beetles emerge in a few weeks. The beetles are remarkably shy, and when disturbed fall to the ground and feign death, remaining perfectly still for a long time.

They feed chiefly at night, and may then be shaken down over tarred boards, by approaching the plants cautiously and jarring them sharply. This is the best way of dealing with the pest, for in the grub state it is exceedingly difficult to destroy without injuring the infested plant. Hoeing in lime and soot, or gas-lime, close to the roots has been recommended, and might be beneficial.

The weevils cannot fly, and therefore migrate slowly to a crop from some neighbouring infested plants; and, if the source of the attack can be discovered, something may be done to remove the danger, and to prevent the further spreading of the infestation. In one case of the 1894 attack the insects were traced to a neighbouring field of raspberry and currant plants.

The New Apple Pest.

In October 1897, apples were sent from Devonshire evidently attacked by some insect not included among the recognised apple pests of this country. The cause of the injury had left the fruit, and its determination during that season was therefore impossible; but the borings so exactly resembled the work of a well-known and much-dreaded American insect (*Trypeta pomonella*) that it was feared that the "apple maggot" had obtained a footing in England.



Segment of infested apple

Mr. C. J. R. Tipper, who sent the apples in the first instance, kindly undertook to watch for indications of the pest during the following season, and was furnished with full information as to the habits of the suspected insect.

No results were forthcoming, however; and I thought it advisable to pay a personal visit to the district in September. The peculiar

infestation was much less noticeable than in 1897; but several specimens were found, and, after careful search, some examples of the cause of injury were at length discovered in the form of small caterpillars, apparently the larvæ of a Tineid moth. For a full identification it will be necessary to breed out some of the specimens, and it is hoped that this may be accomplished next year. The pest is not, therefore, the "apple maggot," and the establishment of this fact greatly lessens the apprehension that it is likely to become a very serious nuisance.

It is a curious coincidence that in 1896 a similar infestation attracted attention in British Columbia. An attack which had been attributed to *Trypeta pomonella* was found to be due to a Tineid moth. Specimens were reared in 1897, and one of the moths was sent to Lord Walsingham for identification.

He recognised it as *Argyresthia conjugella*, an insect known in this country to attack the berries of the mountain ash, *Pyrus aucuparia*. The attack in 1896 was so violent in British Columbia and Vancouver Island as to give rise to much anxiety. The caterpillars from the Devonshire apples do not agree with the descriptions of the larvæ of this particular species, though it is highly probable that the moth will turn out to be an *Argyresthia*.

The work of this pest is very peculiar, and cannot for a moment be confounded with that of the "Codlin" moth, *Carpocapsa pomonella*. The whole substance of the apple is riddled with fine winding burrows, as in the case of *T. pomonella*. When the caterpillar is present, it is by no means easy to extract it unhurt, for the complicated windings of the burrows have to be followed with the greatest care, or the insect will be destroyed at the moment of discovery. In many cases, even after thorough searching, no caterpillar could be found, the fruit being evidently deserted. Often, moreover, the bore took the form of a mere loop between two points on the surface. Apparently the same caterpillar frequently emerges from the apple and enters it again at another point. In bad cases the core had always been reached, and one or more of the pips excavated.

A full account of the pest must be postponed until the moth is definitely determined. Its injury is of a particularly serious nature, and there would be cause for anxiety if its numbers largely increased; but there is not the same reason to fear this as there would have been had the insect proved to be a pest already known to work great havoc in another country.

My thanks are due to Mr. C. J. R. Tipper, who has devoted much time and labour to this inquiry, and who has been of great assistance to me in the investigation so far as it has proceeded.

Insects injurious to the Wood of Poplars.

Together with many other trees, the poplar is subject to the ravages of the Goat moth, *Cossus ligniperda*. This large brown moth, and its huge, ill-smelling caterpillar, reddish-brown above and

flesh-coloured underneath, have been so frequently described that they are pretty generally known as the cause of the large borings which frequently riddle the trunks of oaks, elms, and other foliage trees.

In the case of the poplar, there are two other insects which do very similar injury, and whose work is in danger of being erroneously attributed to the Goat moth. They are comparatively of rare occurrence, but cases of attack by them have recently been brought to the notice of the Zoologist. They are the Hornet "Clear-wing" moth, *Trochilium apiforme*, and a Longicorn beetle, *Saperda carcharias*.

The Hornet "Clear-wing" of the Poplar.

Trochilium apiforme is the largest of our English "Clear-wing" moths, a group remarkable for the transparency of their wings, and their great superficial resemblance to members of the bee and wasp tribe. The insect in question, as its popular name implies, bears a strong similarity, in shape and colouring, to the hornet.

The moth lays its eggs in cracks of the bark, near the bottom of the trunk. The caterpillars bore into the solid wood, where they feed for two years. They seem especially to attack the larger roots till the bark over their burrows easily yields to the pressure of the finger. If left undisturbed, they perforate the base of the trunk, within a foot of the ground, to such an extent that the trees, if not actually killed, are so weakened as to succumb to a moderate gale of wind. An attack of this nature was recorded in my last annual report (Vol. viii., 1897, p. 753), and the treatment there adopted, of clearing out the insect and banking up the injured trees with clay, has been entirely successful.

When the caterpillar has ceased growing, it makes a tough cocoon of silk, mingled with sawdust, at the entrance of its burrow, and from this the moth emerges during the following season.

The caterpillar lives for two years in the tree, in which time it attains the length of an inch and a half. It is yellowish-white in colour, flat and somewhat hairy underneath. It has a large dark-brown head, succeeded by a yellow "neck shield," and the dorsal vessel, visible through the skin, makes a dark line down the middle of the back. There are six true feet, and five pairs of "pro-legs" or suckers.

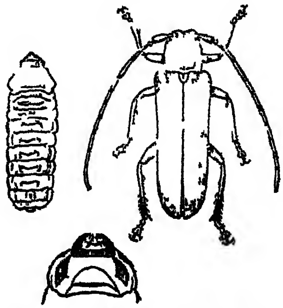
The Large Poplar Beetle.

Saperda carcharias.

Another poplar tree attack, attributed at first to the Goat moth, proved to be the work of this rather rare Longicorn beetle. Its borings in all respects resembled those of that insect. They were mostly to be found near the base of the trunk, some being almost on the ground level, though occasionally they occurred at a height of about ten feet. The characteristic goat-like smell was absent, and the grubs which were extracted from the burrows were

found to be beetle larvæ. Later, some specimens of the mature insect were captured.

Saperda carcharias is a large Longicorn beetle of a uniform yellow-grey colour. It particularly affects fenny districts, where it attacks trees of the poplar and willow tribe.



Saperda carcharias and half-grown larvæ, with enlarged view of the under surface of larval head.

According to Taschenberg, the beetle appears in June, and pushes its eggs deeply into cracks in the bark, where they hatch out in July or August, and bore into the wood. These events probably take place somewhat later in this country, for I did not find any of the beetles until August. The larvæ live two years in the tree, and the serious nature of their injury is evidenced by the continual ejection of sawdust from their burrows. They attain a length of an inch and a half, and are legless, with a small rectangular head and a horny "neck shield," sprinkled with reddish hairs. Most of the other segments are furnished, both above and below, with wrinkled horny plates.

When poplar trees exhibit borings from which sawdust is ejected, the attack may thus be due to one of three different insects. The most usual cause is the Goat moth, and its presence may generally be detected by the characteristic pungent smell. If this is absent, and if the attack is entirely confined to the very bottom of the trunk and the larger roots, and the borings are somewhat superficial, the Poplar Clear-wing moth will be suspected. If the attack occurs in fenny country, and is somewhat more sporadic, the pest is probably *Saperda carcharias*. If one of the grubs at work be extracted, the identity of the pest may be immediately determined. The Clear-wing caterpillar has a large brown head and six legs, besides five pairs of suckers. The *Saperda* grub is small-headed and legless.

Treatment.—It is hopeless to attempt the cure of trees in which the attack has long been neglected. They are a breeding-ground for the pest and a danger to other trees, and should be cut down and the contained grubs destroyed.

If the infestation has not proceeded far, remedial measures are possible, though they entail a good deal of trouble, each boring having to be dealt with separately.

It is certainly advisable first to attempt the extraction of the grubs by inserting into the burrows a piece of wire, bent at the end, and it is wonderful how many can be withdrawn by this means. Frequently, however, the tunnels are so winding that the grubs cannot be reached, and in such cases it has been usual to inject some insecticide, such as paraffin, by means of a syringe, to the nozzle of which a piece of india-rubber tubing has been fixed.

The following new method has, however, been tried with very much greater success. The operator furnishes himself with a piece of stout wire, some cotton-wool, some putty, and a bottle of strong ammonia solution. The tunnels are cleared of sawdust as far as possible, and cotton-wool soaked in ammonia rammed up them as far as it will go, the orifice being then plugged up with putty. A plentiful dose of ammonia must be given, and any neighbouring holes which may possibly be in communication must be also plugged. The fumes will generally prove fatal to the imprisoned grub, whose death may be inferred from the cessation of the output of sawdust.

In the case of each of the above-named insects the pupa or chrysalis is formed at the mouth of the boring, and should be hooked out and destroyed when observed, before the insect can emerge and lay eggs in the tree.

Any measures calculated to discourage the pests from egg-laying are likely to have a good effect. Dressings for this purpose should be applied in June, when the trunks may be lime-washed or painted with some deterrent mixtures, such as "Antipest."

The Vapourer Moth.

Orgyia antiqua.

Among the caterpillars which appeared in abnormal numbers during the dry weather may be mentioned those of the Vapourer moth. They are prettily marked larvæ, easily recognisable by the four yellow brushes of hair which arise from the back, and certain darker tufts, two proceeding antenna-like from the head, while the others project from the sides and tail. The body is blue-grey, spotted and marked with red.

The male moth is a rich brown, with two conspicuous white dots near the hinder margin of the front wings, and with feathery antennæ. It is about an inch and a quarter across the wings

The female has the merest rudiments of wings, and cannot fly.

Scarcely any garden tree is safe from the depredations of this caterpillar, which, from the wingless and inert character of the female moth, is liable to become established in one spot, and to reappear annually.

When the caterpillars have finished feeding they seek a place of shelter, often under the leaves or under window-stones or eaves, and spin a cocoon within which they turn to chrysalids. Those which emerge as male moths fly away in search of their mates, but the female moths remain and actually lay their eggs on the very cocoons they have just quitted.

These egg-covered cocoons are conspicuous objects under window-stones or the beams of railings, and can easily be collected and destroyed. This was done on a large scale, with excellent results, in one of the cases reported to the department.

The Small Ermine Moth.
Hyponomeuta padella.

Another garden and orchard caterpillar which has been particularly active during the past dry season is that of the Small Ermine moth.

It is a small larva, of a dirty green-grey colour, with a black head and black spots on the back. The caterpillars are gregarious, and live in a common web, involving numerous twigs and leaves; and in this web, when full-grown, they spin their cocoons. The moth is small—about three-quarters of an inch across the wings—and prettily marked, the fore wings being silvery white sprinkled with black spots, and the hind wings a leaden grey. It has a special partiality for the hawthorn, but also visits various fruit trees, on which its attack, if not checked, may become serious. It is, however, a comparatively simple matter to remove and destroy whole webs of caterpillars and chrysalids, and thus prevent the spread of the infestation.

The Cabbage and Swede Green-fly.
Aphis brassicæ.

The "blight," or "green-fly," which is almost always present to some extent on turnip crops, is too familiar to need description. There are two species which commonly attack turnips, but the one under consideration is particularly partial to Swedish turnips and cabbages.

In some districts this pest increased to an almost unprecedented extent during the long spell of dry weather in the late summer, and hundreds of acres of swedes had their leafage entirely destroyed, and polluted the air with a most offensive odour.

It would be a mistake to attach undue importance to an attack occurring under circumstances so exceptional. No one could foresee that the advent of rain, which would have checked the pest and helped on the crop, would be so long delayed. It is a fitting occasion, however, for once more stating the reasons why an attack of "blight" or green-fly should be combated, beyond all other insect pests, at the very first moment that it appears likely to become formidable.

No insects increase with such marvellous rapidity as the green-fly tribe, as may be gathered from the following life-history, which may be taken as generally true of all the common species of aphides.

The males appear only in the autumn, when there are also winged females. After pairing, the females lay eggs which do not hatch until the following spring, when they give rise to wingless females, capable of producing about thirty living young, which are wingless like themselves. These in turn similarly give rise to living young in the course of a few days, and, as there may be

twenty such generations during the year, the increase will be seen to be incredibly rapid.

Curtis remarks that one spring egg would become 729,000,000 aphides by the middle of September, after only seven generations, were it not for the depredations of the numerous enemies which feed upon them.

After the first two or three generations, winged as well as wingless females are produced, and it is by their instrumentality that the attack is spread to other crops. The common impression that "blight" is due to a particular condition of the atmosphere is for the most part fallacious, the apparently sudden appearance of the pest being chiefly due to its very rapid rate of increase; but it is possible that it may have something to do with the sudden and simultaneous awakening of the winter eggs in the spring, and winds may certainly direct the flight of the winged females which are produced in the summer.

Besides the importance of prompt treatment of aphis attacks, there is another consideration worth attention in this connection.

Root crops are not continuous, and the winter eggs laid on swede leaves, for instance, will for the most part be destroyed in the usual agricultural operations, and it is therefore not from the turnip crops of one year that those of the following year derive the attack. But there are certain weeds of the turnip order (*Cruciferæ*), such as Charlock and Shepherd's Purse, upon which the aphis is equally at home, and if but a few survive on such weeds they are capable, as we have seen, of giving rise, under suitable conditions, to the infestation of next year's crop. This is a strong reason for the extermination, as far as possible, of such weeds along the borders of a root-crop.

Amongst the most voracious destroyers of green-fly are the grubs or larvæ of the various lady-birds.

These coccinellid beetles are generally known and recognised as beneficial insects, but the larvæ are by no means as familiar as they deserve to be. I have frequently had specimens sent me, under suspicion of injuring turnip and other crops. Where there is evidently some insect injury, and these grubs are abundant, it is quite natural that the farmer should suspect them of being its cause, especially when, as in the case of "surface caterpillars," the true culprits carefully conceal themselves by day. They may perhaps be recognised from the following short description. They are flattish slate-coloured grubs, a quarter of an inch, or sometimes more, in length, with six rather long legs, and with many black spots and hairy tubercles on the back. There are also a few bright red or yellow spots, which are particularly characteristic of these grubs.

There are two common species of *Coccinellæ*, the larger "seven-spot" lady-bird, with bright red wing-cases, on which there are seven round black dots (*C. septempunctata*), and the smaller "two-spot" insect, which is very variable in colour (*C. bipunctata*).

The eggs are laid in small yellow patches under leaves infested

by green-fly. When the larvæ have finished feeding, they hang themselves up by the tail to the leaf and change to black pupæ, or chrysalids, with orange spots. Thus the whole life-history takes place in the same locality; and on a single leaf may frequently be seen the yellow eggs, the slate-coloured larvæ, the pupæ, and the mature insects.

Root-knot Eel-worm in Cucumber Roots.

Heterodera radicicola.

This little-known pest is apparently on the increase in this country. Its presence in England was first recorded by Miss Ormerod in 1892, and of late years it has received much attention from that investigator, and from certain American entomologists, notably Professor S. F. Atkinson. During the past year two cases of this infestation have been brought to the notice of the Zoologist.

Cucumbers and tomatoes are the plants attacked. During the first year they are generally observed to fail, for no obvious reason, and during the second year some of the plants probably die outright. Examination of the roots shows the presence of galls or swellings very similar to those characteristic of the familiar disease known as "Finger-and-toe" in turnips. If such swellings are observed in the roots of failing cucumber or tomato plants, it is tolerably safe to infer that *Heterodera radicicola* is at work, but the pest is so minute as to require the use of a moderately powerful microscope to establish its identity with certainty.

It is an eel-worm closely related to the "stem eel-worm" (*Tylenchus devastatrix*), which causes "tulip-root" in oats. In size, and in their eel-like shape, the males of the two species are very similar, but the female *Heterodera* becomes curiously pear-shaped or flask-like, its distended body being full of eggs and young worms. The length of the male is about one twenty-fifth of an inch.

In the cases referred to, the carbolic treatment recommended by Miss Ormerod was tried with marked success. The soil in which the cucumbers are grown was dressed with carbolic acid at the rate of 33 oz. to 15 cubic feet; and the infested crops are reported to be in a satisfactory condition.

Miscellaneous Pests.

Among the numerous pests concerning which advice has been asked, but which do not call for special comment, may be mentioned the following:

Fly-pests (Diptera): Warble fly, Sheep-bot fly, Crane fly, Wheat-bulb fly, and the Narcissus fly (*Merodon equestris*) infesting bulbs.

Beetle pests (Coleoptera): Wire-worm, cockchafer and summer-chafer, bean beetles, bark beetles, and various species injurious to stored grain.

Caterpillar (Lepidoptera) infestations have been very numerous

and widespread, while inquiries have been received concerning the non-insect pests, stem eel-worm in oats, currant gall-mite, and the field slug (*Limax agrestis*).

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ON DRIED GRAINS AS A SUBSTITUTE FOR HAY:

AN EXPERIMENT IN BULLOCK-FEEDING AT WOBURN, 1897-8.

DRIED grains are now used to a considerable extent on the farm, and their value as a feeding material is believed in by practical men very generally. It appeared to the Chemical Committee of the Royal Agricultural Society desirable to try, at the Woburn Farm, an experiment with the object of seeing how far, in case of scarcity of hay, replacement of it by dried grains could be made, and whether advantageously or not. The experiment was to be with bullocks, and, at the time of undertaking it (December, 1897), the relative prices of hay (taking its then selling value as a basis) and dried grains, at the Farm, were :—

	per ton £	s.	d.		per ton £	s.	d.
Hay . .	3	0	0,	add cost of cutting and chaffing 5*s*. .	3	5	0
Dried grains	3	15	0,	add cost of carriage 12*s*. 3*d*., carting 1*s*.	4	8	3

The hay was good meadow hay, grown on the farm and secured well; the grains were obtained from Burton.

Sixteen Shorthorn bullocks, rising 3 years old, which had been kept together on the farm and fed similarly for some time past, were chosen for the experiment, and were, in accordance with the usual practice on the farm when feeding trials are made, divided into two sets of eight each and distributed evenly between the feeding boxes (8), shed (4), and open yard (4), so that in each place of feeding there were the same number of animals belonging to each of the two sets.

The comparison being between hay and dried grains, these foods, as also water, were given *ad libitum*, but in other respects the diet was the same for the two sets, and as follows :—

			lb per head daily
Decorticated cotton-cake . .	commencing	with	3
Maize meal	„	„	3
Swedes	„	„	28

On February 13, 1898, mangels were substituted for swedes, and from March 1 linseed cake was given in addition to each set.

Samples of the foods employed were taken once a week during the experiment, and monthly analyses of these were made, Table I, giving the following as the average composition of each food :—

TABLE I.—*Analyses of the Foods used during the Experiment.*

—	Decorticated cotton-cake	Maize meal	Linseed cake	Meadow hay chaff	Dried grains	Swedes	Mangels
Moisture	8·39	13·83	12·50	12·89	11·57	88 79	86 66
Oil	12 06	4·15	12 50	2 50	7·40	—	—
[1] Albuminous compounds	48·92	9 55	31·34	7·43	17·00	·96	1·18
Starch, sugar, digestible fibre, &c.	20 88	69 52	31·78	45 59	42 36	8 58	10·38
Woody fibre	4 25	1 33	6 16	24·65	16 85	1·07	·78
Mineral matter (ash)	5·50	1·62	5·42	6·94	4·82	·60	1 00
	100·00	100·00	100·00	100·00	100·00	100·00	100·00
[1] containing nitrogen	7·82	1·52	5·01	1·19	2·72	·15	·19

The costs of the respective foods were:—

	per ton £	s.	d.		per ton £	s.	d.
Decorticated cotton-cake	6	2	6,	carriage 14*s.*, breaking 2*s.* 6*d.* . . .	6	19	0
Maize meal .	4	17	6,	carriage paid	4	17	6
Linseed cake	8	12	6,	„ „ carting and breaking 2*s.* 6*d.*	8	15	0
Hay . .	3	0	0,	cutting and chaffing 5*s.*	3	5	0
Dried grains	3	15	0,	carriage 12*s.* 3*d.*, carting 1*s.* . . .	4	8	3

The sixteen bullocks were weighed on December 22 between 10 A.M. and 12 noon, having received only a limited ration first thing that morning, consisting of 2 lb. cake and meal, 5 lb. of chaff, and 12 lb. roots per head. Subsequent weighings were made under similar conditions of time and feeding. The bullocks were then divided into two sets of eight each in such a way as to make the lots in each feeding place as comparable as possible. The total weights of the eight animals comprising each set were 83 cwt. 0 qr. 12 lb. and 83 cwt. 0 qr. 18 lb. respectively.

I.

At the outset, as mentioned, 3 lb. of decorticated cotton-cake and 3 lb. of maize meal per head daily were given in each case, along with 28 lb. of swedes. On January 2 the swedes were raised to 35 lb., and on January 23 the cotton-cake and maize to 4 lb. of each. Hay, dried grains, and water were given *ad libitum*, and it was found that from the beginning the hay-fed animals took from 18 to 19 lb. of hay chaff per head daily, while the dried grains lot consumed variable quantities from 12 to 15 lb. per head daily. The animals on hay, however, drank about 7 lb. more water per head daily than those on the grains. This applied equally to the several

sets in the different feeding-places. It was noticed from the outset that the animals feeding on the dried grains did not seem to fill themselves properly on the food given them, and that they appeared to get tired of the grains, for they preferred to pick over their litter rather than eat more grains. At first they were given 10 lb. of grains each daily, and gradually increased to 16 lb. in the third week, after which they fell off again to 13 lb.; the hay-fed animals having kept on regularly all the time on 18 to 19 lb. per head daily of hay chaff.

The first experimental weighing was taken on January 31 after forty days' feeding, the weights then recorded being given in Table II.

TABLE II.—*Table giving the Live Weights of the Bullocks at commencement and end of First Part of the Experiment, December 22, 1897, and January 31, 1898—forty days' feeding.*

SET I.—BULLOCKS ON DRIED GRAINS.

No.		Live Weights						Gain in 40 days
		December 22, 1897			January 31, 1898			
		c.	qr.	lb.	c.	qr.	lb.	lb.
in boxes	1	11	1	0	12	1	6	118
	2	10	2	10	11	2	15	117
	3	11	0	7	11	3	2	79
	4	10	2	2	10	3	9	85
in shed	9	10	2	2	11	2	2	112
	10	10	1	0	10	2	4	32
in yard	13	9	1	25	10	2	14	129
	14	9	1	22	9	3	22	56
		83	0	12	89	0	18	678

SET II.—BULLOCKS ON HAY.

No.		December 22, 1897			January 31, 1898			Gain in 40 days
		c.	qr.	lb.	c.	qr.	lb.	lb.
in boxes	5	10	2	4	11	3	2	138
	6	10	3	14	12	0	0	126
	7	10	2	25	11	3	0	115
	8	11	1	5	12	1	2	109
in shed	11	10	1	24	11	1	7	95
	12	10	1	6	11	0	15	93
in yard	15	9	0	24	10	0	4	92
	16	9	3	0	11	1	2	170
		83	0	18	91	2	4	938

Gain per head daily—Set I., on dried grains . . . . 2·12 lb.
" " " —Set II., on hay . . . . . 2·93 "

From this Table it will be seen that while the gain was good all round in the case of the hay-fed bullocks, the lowest gain being close on 100 lb. in the forty days, in the case of the bullocks fed on dried grains there was much less uniformity; and whereas the highest

gain only reached 129 lb. as against 170 lb., there were two of 35 lb. or so only, and two others considerably below 100 lb. The same general result was found in each of the three different feeding-places. In the case of the eight animals in the feeding-boxes, the figures were :—

Gain per head daily, on dried grains	2·18 lb.
„ „ „ on hay	3·05 „

A return of the foods consumed during this period, December 22 to January 31 (forty days), showed that the respective amounts used by the eight beasts of each set were :—

	cwt	qr.	lb.		cwt	qr	lb
Dried grains . .	37	1	6	Hay . . .	51	3	21

or, roughly, 37 cwt. of grains and 52 cwt. of hay, the cost of which, at the prices given before, would be, approximately :—

	£	s.	d.		£	s.	d.
Dried grains . .	8	3	6	Hay . . .	8	10	0

The live-weight figures of January 31 show that an increase of 938 lb. less 678 lb. = 260 lb. live-weight was obtained by the consumption of the 52 cwt. of hay as compared with that of the 37 cwt. of dried grains. This 260 lb. would be, roughly speaking, equivalent to 19 stone of carcass meat, which, at 4*s.* per stone, would have fetched 76*s.* Thus 76*s.* extra would have been realised at the extra cost in hay of 6*s.* 6*d.* (8*l.* 10*s.* 0*d.* less 8*l.* 3*s.* 6*d.*), and there would have been a clear advantage from the feeding with hay.

From this first part of the experiment, accordingly, as also from general observation throughout the experimental period, it was shown that in bullock-feeding it does not do to replace hay entirely by dried grains.

II.

Having established this, it seemed desirable to try whether though dried grains had failed to replace hay entirely, they might not yet be able to replace it *in part* with advantage. With the view of testing this, the eight bullocks fed on hay were kept on at their former food and rations, but to the eight bullocks of the dried grains set 5 lb. per head daily of hay chaff was given, and they were left to take what further amount of dried grains they would. The immediate effect of this was not to reduce materially the quantity of dried grains taken, but it was found that the bullocks took within 1 lb. of what they had been having before, and the 5 lb. of hay chaff as well; the grains, in fact, were now eaten quite readily. The total of the fibrous foods in the two sets was closely alike. As the experiment went on, the tendency was noted for the fibrous food to decrease in amount, but this was equally the case with the hay-fed lot. Table III. gives the average daily amounts of dried grains, hay, and water taken during each week of the entire experiment. The considerably larger quantity of water drunk with the hay chaff is noticeable.

TABLE III.—*Average daily amounts of Dried Grains, Hay, and Water taken per head throughout Experiment.*

Week	Set I.—Dried grains			Set II.—Hay	
	Grains	Hay	Water	Hay	Water
	lb.	lb.	lb.	lb.	lb.
December 22–25	10½	—	46½	17¾	55
„ 25–January 1	12	—	48½	18	53½
January 2–8	15⅓	—	49¾	18¾	54
„ 9–15	14⅓	—	49¼	19½	59
„ 16–22	14	—	52	19	60
„ 23–29	13½	—	56½	18½	60¼
„ 30–February 5	12	—	5[illegible]¾	17	60¼
February 6–12	11¾	5	58	16¾	61½
„ 13–19	11⅓	5	52¾	17	62
„ 20–26	11⅔	5	48¼	16¾	58
„ 27–March 5	11¼	5	48¾	16⅓	59½
March 6–12	8¾	5	48¼	15⅓	59¼
„ 13–19	9	5	51	14⅓	59¼
„ 20–26	9	5	48	14½	60¾
„ 27–April 2	8⅔	5	49	13¾	59
April 3–9	8¼	5	49½	13	62
„ 10–16	7⅓	5	49	12	62⅓
„ 17–23	6½	5	54½	12	63⅓
„ 24–30	7	5	50¾	11½	60
May 1–10	6⅔	5	62	12⅓	72⅔

On February 13, mangels began to be substituted for swedes, a mixture of the two kinds of roots being used for the first fortnight, and then mangels alone being given. Another weighing was taken on February 28, the feeding during this second period having lasted twenty-eight days. The results are given in Table IV. The experiment was continued on much the same lines, and a third weighing was given on April 12, after a further period of forty-three days, and here, for practical purposes, the experiment ended. The weights are given in Table IV. Some few changes of feeding were resorted to during these periods. In the first place mangels, as stated, were given entirely after February 27, at the rate of 35 lb. per head daily. This quantity was increased to 40 lb. on March 7, but the animals became too "loose," and after two days' feeding they had to go back to the 35 lb. About the same time, as the result of a visit of inspection paid by Mr. Terry (a member of the Committee), who considered the bullocks to be hardly progressing as fast as they might, an addition of 2 lb. of linseed cake per head daily was made to the diet of both sets. On March 13 this was increased to 3 lb. per head daily, while the maize meal was reduced to 2 lb. in consequence of continued "looseness" of some of the animals, and subsequently (April 6) the linseed cake was increased to 4 lb.

During the first of these two periods it was noticed that bullock No. 8 (hay) was for several days very "loose" and indisposed; also that Nos. 6, 8, and 16 (all on hay) drank large quantities of water,

TABLE IV.—*Live Weights during Second Part of the Experiment, February* 28 *and April* 12, 1898—*after* 28 *and* 43 *days' feeding.*

SET I.—DRIED GRAINS AND HAY.

No.		Live weights Jan 31			Feb 28			April 12			Gain In 28 days	In 43 days	In 71 days
		c	qr	lb	c	qr	lb	c	qr	lb	lb	lb	lb
in boxes	1	12	1	6	12	3	6	14	0	14	56	148	204
	2	11	2	15	12	0	24	13	2	2	65	146	211
	3	11	3	2	12	2	0	13	2	0	82	112	194
	4	10	3	9	11	2	10	12	1	14	85	88	173
in shed	9	11	2	2	12	0	7	12	2	16	61	65	126
	10	10	2	4	11	0	2	12	0	21	54	131	185
in yard	13	10	2	14	11	2	16	13	0	8	114	160	274
	14	9	3	22	10	1	14	10	3	20	48	62	110
		89	0	18	94	0	23	102	1	11	565	912	1,477

SET II.—HAY.

No.		Jan 31 c	qr	lb	Feb 28 c	qr	lb	April 12 c	qr	lb	In 28 days	In 43 days	In 71 days
in boxes	5	11	3	2	12	1	5	12	2	20	59	43	102
	6	12	0	0	12	2	24	13	2	7	80	95	175
	7	11	3	0	12	1	0	13	0	5	56	89	145
	8	12	1	2	12	1	5	13	2	4	3	139	142
in shed	11	11	1	7	11	3	5	12	2	12	54	91	145
	12	11	0	15	11	2	2	12	2	14	43	124	167
in yard	15	10	0	4	10	3	7	11	2	20	87	97	184
	16	11	1	2	11	3	22	12	3	21	76	111	187
		91	2	4	95	2	14	102	2	19	458	789	1,247

	1st period	2nd period	whole period (71 days)
	lb	lb.	lb.
Gain per head daily—Set I., dried grains and hay	2·52	2·65	2·60
" " " —Set II, hay . . .	2·04	2·30	2·20

A reference to Table III. will show that during the first period of twenty-eight days, January 31 to February 28, the difference between the foods consumed by the two sets was practically this, that from 11 to 12 lb. a day of dried grains were taken by each animal in Set I. as against the same weight of hay chaff by each animal in Set II. During the second period of forty-three days, February 28 to April 12, both sets took less of the fibrous foods, dried grains, and hay chaff, but as before, the total quantities were closely alike, the dried grains plus the 5 lb. of hay per head daily just about equalling the hay chaff when fed alone. Taking the whole period of seventy-one days, January 31 to April 12, it was found that the average daily amount of dried grains consumed per head by Set I. was 10·1 lb. along with 5 lb. of hay, and that of hay consumed by Set II. 15·1 lb., so that the difference of cost of food was that of 10·1 lb. of dried grains fed daily for seventy-one

days to eight bullocks as against 10·1 lb. of hay similarly fed for a like period to eight bullocks. This would be practically the cost of $2\frac{1}{2}$ tons of dried grains (11*l.* 0*s.* 7*d.*) against that of $2\frac{1}{2}$ tons of hay (8*l.* 2*s.* 6*d.*), the dried grains, accordingly, costing 2*l.* 18*s.* 1*d.* more. The gain in live weight during this period of seventy-one days[1] was 230 lb. (1477 less 1247) in favour of dried grains, which, at 14 lb. to the stone, would be equivalent to an increase of $16\frac{1}{2}$ stone of carcass meat, fetching, at 4*s.* a stone, 3*l.* 6*s.*, and thus leaving a small balance on the eight animals when the extra cost of the dried grains is taken into account.

From this it would appear that while dried grains, used along with a small quantity of hay chaff, can replace hay quite well as a food for bullocks, and give a larger increase of live weight, yet at the respective prices quoted for dried grains, and hay, and carcass meat, there is very little monetary difference whether dried grains are used along with the small quantity of hay chaff, or whether hay chaff is used alone. Further, from the earlier part of the experiment it is clear that dried grains cannot be made to replace hay entirely for bullock-feeding, but that hay or similar food must be used along with them. Also that the same weight of fibrous food will be required whether hay be used alone or as a supplement to dried grains.

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THE RELATIVE VALUES OF DIFFERENT FIBROUS FOODS FOR SHEEP:

A FEEDING EXPERIMENT AT THE WOBURN FARM, 1897–8.

PREVIOUS experiments, as also general experience, having pointed to the value of including some "fibrous" food, such as hay or straw, in the diet of sheep fattening off on roots, it was felt desirable to experiment further at the Woburn Farm in this direction, and to ascertain, if possible, whether there were any fibrous foods more suited than others for this purpose.

The winter of 1897–8, if winter it might be called, was essentially a favourable one, being abnormally dry, with comparative absence of rough weather and extreme cold. The field selected for the experiment was one of a light character, with suitable slope; the sheep used were of good type and feeding quality, and did extremely well throughout; the roots (swedes) were exceptionally sound, and, for this land, of good size and quality.

[1] Bullock No 8 (on hay) was indisposed during the first period, but pulled up again in the second. It is fairer, therefore, to consider the two periods together, and not separately.

A lot of ninety lambs, Hampshire Down with a slight cross of Oxford, had been purchased early in November from near Oxford, and they cost, with railway carriage, 2*l.* 3*s.* 6*d.* each. Though rather dear, the sheep were of excellent quality, and a very uniform lot on the whole. From these ninety, thirty were taken away on November 27, as being the more forward of the lot, and the remaining sixty were kept for the experiment. A valuation placed upon them at this time (November 27) put the selected sheep at 2*l.* 0*s.* 6*d.* a head.

On November 29, after receiving early in the morning a limited ration of 6 lb. of swedes and ¼ lb. of mixed cake and chaff per head, the sixty sheep were individually weighed between 10 A.M. and noon, and, according to the weights and general appearance, were divided as evenly as possible into four lots of fifteen sheep each. They were then marked, and the experiment practically commenced the following day, November 30.

The plan of the experiment decided upon was to compare two or three different foods, or mixtures of foods, of a fibrous nature, and to see whether the giving of one or the other produced any marked difference in feeding value. The foods selected for comparison were:—

Pen I. Oat straw chaff.
„ II. Meadow hay chaff.
„ III. Meadow hay chaff and oat straw chaff, half and half.
„ IV. Dried grains.

The above foods were intended to be given *ad libitum*, and roots likewise, the other food (linseed cake) being given in the same quantity to each of the four lots. The weights of the four pens at commencement, as the tables given later show, were closely alike—viz.:—

		Total weight cwt.	qr.	lb.
Pen I.	Fifteen sheep	16	2	3
„ II.	„	16	1	27
„ III.	„	16	2	2
„ IV.	„	16	2	3

TABLE I.—*Average Composition of the Foods used throughout the Experiment.*

—	Linseed cake	Oat straw chaff	Meadow hay chaff	Dried grains	Swedes
Moisture	13·01	14·98	12·90	11·57	89·35
Oil	12·77	2·13	2·51	7·40	—
[1] Albuminous compounds	31·11	3·91	7·43	17·01	1·04
Starch, sugar, digestible fibre, &c.	31·62	39·32	45·57	42·34	7·96
Woody fibre	6·12	32·86	24·05	16·86	1·06
Mineral matter (ash)	5·37	6·80	6·94	4·82	·59
	100·00	100·00	100·00	100·00	100·00
[1] containing nitrogen	4·98	·62	1·19	2·72	·17

The different foods used were sampled, in accordance with the usual rule, weekly, and analysed monthly, the average composition being set out in Table I. on the preceding page.

The foods were all of good quality. Swedes were used throughout, with the exception of the last ten days, when a few sheep were still left to fatten off, and, as the swedes would hold out no longer, mangels were used instead. The dried grains were obtained from Burton; the straw and hay were grown on the farm. The cost of the foods was as follows:—

	Price per ton £	s.	d.
Linseed cake, 8*l.* 12*s.* 6*d.* per ton, carriage paid; add 2*s.* 6*d.* cost of cartage and breaking	8	15	0
Dried grains, 3*l.* 15*s.* per ton; carriage 12*s.* 3*d.*, cartage 1*s.*	4	8	3
Oat straw chaff, 1*l.* 12*s.*, including chaffing	1	12	0
Meadow hay chaff, 3*l.* per ton; cutting and chaffing, 5*s.*	3	5	0
Swedes, say, 7*s.* per ton	0	7	0

The sheep began with $\frac{1}{3}$ lb. of linseed cake per head daily; this was increased on February 6 to $\frac{3}{4}$ lb., and on April 3 to 1 lb. to finish off with. To Pen III., meadow hay chaff and oat straw chaff well mixed together were given in equal quantities. These, as well as the other fibrous foods, and the swedes, were intended to be given *ad libitum.* This was the case throughout with the swedes, and with the oat straw and meadow hay; but in the case of the dried grains the sheep showed such a liking for them that—for financial reasons—a check had to be put on the quantity given to them, so as to keep this within profitable bounds. In the other pens the sheep ate comparatively small amounts of fibrous food (from ·31 to ·37 lb. per head daily on an average), and, consequently, Pen IV. (dried grains) had to be limited to approximately the same. Beginning with $\frac{1}{4}$ lb. of dried grains per head daily, the average throughout the experiment was ·39 lb. There is very little doubt that the sheep would have taken a considerably larger amount of dried grains had they been allowed it, but this could not have been economical. While the sheep in the other pens ate, as stated, only a limited amount of fibrous food, they consumed, on the other hand, large amounts of roots. With the object of getting them to eat more of the fibrous foods the roots were, after the weighing on January 18, kept down to about 24 lb. per head daily for a time, and more chaff, &c., given; but the sheep would not eat the latter any more freely, so the former condition was restored.

Pen I. (oat straw) ate the most roots, then Pen III. (meadow hay and oat straw), while Pen IV. (dried grains) took the least. Table II. opposite gives the total quantities of food consumed by each pen throughout the experiment, which lasted, in all, 142 days, though as the sheep became fat they were drafted off at earlier periods—viz. after 98 days and 119 days.

The losses and inequalities generally found in feeding a number of sheep during a winter were, mainly owing to the very open character of the weather, very small. Soon after the commencement, following a heavy gale that occurred during the night of December 30,

one sheep (No. 1) in Pen II. was found dead in the morning. This was at once replaced by another of similar weight which had been kept in a reserve pen. Early in January several of the sheep in Pen IV. showed signs of having colds, but this did not appear to affect their appetites. About January 12, one sheep (No. 2) in Pen II. seemed to be off his feed, but did well in the end; and lastly, on March 16, sheep No. 15, in Pen II., was found to have just died. He was very fat and showed no sign of wasting, so the carcass was dressed and weighed; the value, reckoned on the price given for the other sheep as a whole (5*s.* 2*d.* per stone), being counted in with the others though the carcass was not sold for human food.

TABLE II.—*Food consumed during Entire Period.*

—	Pen I. (Oat straw chaff)		Pen II. (Meadow hay chaff)		Pen III. (Meadow hay and oat straw)		Pen IV. (Dried grains)	
	Total weight	Daily average per head	Total weight	Daily average per head	Total weight	Daily average per head	Total weight	Daily average per head
	t. c. q. lb.	lb.	t. c. q. lb.	lb.	t. c. q. lb.	lb.	t. c. q. lb.	lb.
Swedes	19 6 3 4	25·23	15 17 0 16	24·81	19 1 2 12	24·87	18 11 0 4	24·51
Mangels	7 3 2		7 3 22		7 0 26		5 3 26	
Linseed cake	9 3 10	·62	9 3 0½	·62	9 3 10	·62	9 3 10	·62
Oat straw chaff	5 2 4	·35	—	—	5 3 6	·37	—	—
Meadow hay chaff	—	—	5 1 2	·34			—	—
Dried grains	—	—	—	—	—	—	6 0 21	·39

The experiment began, as stated, on November 29. The first intermediate weighing was taken on January 18 after fifty days' feeding, the sheep having received, as at the commencement, only a limited ration on the morning of weighing. The same rule was observed at subsequent weighings. Subsequent to this weighing the linseed cake was, on February 6, increased to ¾ lb. per head daily. Mr. J. P. Terry, of Aylesbury (a member of the Council), went down on February 22 and examined the sheep thoroughly. He considered them very good, and selected six out of each pen which he thought should go off very shortly. Accordingly, on March 7, all the sheep were weighed again, after limited feeding; the selected ones were removed, fasted for twenty-four hours, and the fasted live weights taken the next day. They were then sent off to Bedford and killed the same afternoon, the carcass weights being taken on the following morning. The sheep were sold by carcass weight, and the price agreed on was 5*s.* 2*d.* per stone. At that time probably 5*s.* 4*d.* per stone could have been got for good quality mutton, but, considering the number of sheep sent for killing all at the same time, and the extra trouble involved in weighing the carcasses, &c., the price given cannot be considered unsatisfactory. The remainder of the sheep continued feeding as before until March 28,

when another draft of five sheep from each pen was taken out, and weighed as before. From Pen II. four sheep only were taken, owing to the previous death of one on March 16, as already recorded. On turning to the table of final weights it will be noticed that in some cases the loss by fasting was rather high. This may be accounted for by the fact that, owing to rain threatening, the sheep were, after their weights (unfasted) had been taken, brought under cover, so as to get the fasted weights with the fleeces still dry, and this rather fretted some of the sheep. This second lot was sent to Bedford and killed on March 29, like the others.

This left four sheep in each pen, and, to finish them off, the linseed cake was increased, on April 3, to 1 lb. per head daily. On April 10 mangels had to be used till the close. By April 20 the sheep were all fit to kill, and they were accordingly weighed, fasted, sent off, killed at Bedford, and the carcass weights recorded as before.

The same price—viz. 5*s.* 2*d.* per stone—was realised for the sheep all round.

The Tables III., IV., V. and VI., on the succeeding pages, give all particulars regarding the weights of individual sheep, and the several pens at the commencement and at the different times of weighing, the gains obtained, the carcass weights, and prices realised.

As to the general appearance of the sheep themselves, when Mr. Terry inspected them on February 22 he placed Pen IV. (dried grains) as distinctly the best, both as regards evenness and ripeness. Pen III. (meadow hay and oat straw) he considered the next best, and Pen II. (meadow hay) rather better than Pen I. (oat straw). When, however, the sheep were allowed to go on until they were all fat and the final weights came to be taken, there was not any corresponding difference of weight, and, as regards the carcasses, it must be said that the whole of them were sound in every respect, and all ripe and good; some few were pronounced by the butcher "over fat," but these did not belong to any one pen in particular, the sheep, as a whole, in the different pens, not varying in any perceptible manner. The only exception was that in the case of the twenty sheep (five from each pen) sent off on March 28 the butcher pointed out some from Pen IV. (dried grains), which he described as being "nicer meat" than the rest.

Towards the end of March there were snowstorms on three successive days, and some of the sheep in Pen IV. (dried grains), which were suffering from colds, appeared to be affected considerably. To this cause may, in great measure, be attributed the small increase shown by this pen in the third and fourth periods of the experiment, rather than to the sheep being fully ripe at the end of the second period, and doing no good by the subsequent feeding.

It now remains to consider the respective gains obtained in the different pens, the prices realised, and the comparison of the latter with the cost of the foods used in each case.

TABLE III.—*Live Weights of the Sheep at each Period, Gains in Live Weight, Fasted Live Weights, Carcass Weights, &c.*

PEN I.—SHEEP ON OAT STRAW CHAFF.

No.	Live weights: Nov. 29, 1897	Jan. 18, 1898	March 7	March 28	April 20	Gain in live weight: In 50 days	In 19 days	In 21 days	In 44 days	In total period	Total number of days fattening	Fasted live weight	Loss by fasting	Carcass weight	Price realised
	c. q. lb.	c. q. lb.	c. q. lb.	c. q. lb.	c. q. lb.	lb.		lb.	lb.	lb.		c. q. lb.	lb.	st. lb.	£ s. d.
1	1 0 7	1 0 26	1 1 21	—	1 2 14	19	23	—	21	63	142	1 2 4	10	11 2½	2 18 5½
2	1 0 8	1 1 0	1 1 19	—	—	20	19	—	—	39	98	1 1 15	4	9 7	2 11 0
3	1 0 14	1 1 2	1 1 21	1 2 1	—	16	19	5	—	43	119	1 1 20	9	10 2	2 12 11½
4	1 0 9	1 0 26	1 1 25	1 2 0	—	17	25	5	—	47	119	1 1 21	7	10 2	2 12 11½
5	1 0 17	1 1 18	1 2 11	—	—	29	21	—	—	50	98	1 2 2	9	10 7	2 16 2
6	1 0 5	1 1 1	1 1 21	—	1 2 17	24	20	—	24	68	142	1 2 8	9	11 5	3 0 0½
7	1 0 19	1 1 1	1 1 23	—	1 1 27	10	22	—	4	36	142	1 1 16	11	10 3	2 13 7
8	0 3 26	1 1 15	1 1 6	—	1 1 22	17	19	—	16	52	112	1 1 14	8	10 3	2 13 7
9	1 0 11	1 1 1	1 1 14	1 1 27	—	18	13	13	—	44	110	1 1 16	11	10 2	2 12 11½
10	1 0 6	1 0 21	1 1 19	1 1 26	—	15	26	7	—	48	119	1 1 16	10	9 5½	2 10 [illegible]
11	1 1 0	1 2 2	1 2 16	—	—	30	14	—	—	44	98	1 2 11	5	11 6	3 0 8½
12	1 0 10	1 1 14	1 2 5	1 2 6	—	32	19	1	—	52	119	1 1 27	7	10 6	2 15 6½
13	1 0 15	1 1 17	1 1 26	—	—	30	9	—	—	39	98	1 1 21	5	10 3	2 11 7
14	1 0 3	1 0 27	1 1 14	—	—	24	15	—	—	39	98	1 1 8	6	9 3	2 8 5
15	1 0 21	1 1 17	1 2 11	—	—	24	22	—	—	46	98	1 2 7	4	11 1	2 17 5½
Total of fifteen sheep	16 2 3	19 1 20	21 3 26	—	—	325	286	—	—	710	—	21 3 10	115	155 2	10 17 5½
Average per sheep	1 0 11	1 1 5	1 1 24	—	—	21	19.1	—	—	47⅓	—	1 1 23	7[illegible]	10 [illegible]	2 11 6

Gain per head daily during whole period . . . ·405 lb. Percentage of carcass to fasted live weight . . . 51·81.

TABLE IV.—*Live Weights of the Sheep at each Period, Gains in Live Weight, Fasted Live Weights, Carcass Weights, &c.*

PEN II.—SHEEP ON MEADOW HAY CHAFF.

No.	Live weights: Nov 20, 1897	Jan. 18, 1898	March 7	March 28	April 20	Gain in live weight: In 50 days	In 48 days	In 21 days	In 14 days	In total period	Total number of days fattening	Fasted live weight	Loss by fasting	Carcass weight	Price realised
	c. q. lb.	c. q. lb.	c. q. lb.	c. q. lb.	c. q. lb.	lb.	lb.	lb.	lb.	lb.		c. q. lb.	lb.	st. lb.	£ s. d.
1	1 0 12	1 1 4	1 1 24	—	—	20	20	—	—	40	98	1 1 21	3	10 2	2 12 11½
2	1 0 10	1 0 15	1 1 3	—	1 1 22	5	16	—	19	40	112	1 1 11	9	10 0	2 11 8
3	0 3 21	1 0 8	1 0 24	—	1 1 14	15	16	—	18	49	112	1 1 4	10	9 5	2 9 8½
4	1 0 9	1 1 3	1 1 22	1 2 1	—	22	19	7	—	48	119	1 1 21	8	9 5½	2 10 0½
5	1 0 16	1 1 8	1 2 0	—	—	20	20	—	—	40	98	1 1 22	6	10 3	2 13 7
6	1 0 17	1 1 16	1 2 8	1 2 17	—	27	20	9	—	56	119	1 2 5	12	11 6½	3 1 0
7	1 0 13	1 1 7	1 2 8	—	—	23	20	—	—	51	98	1 2 1	7	11 1	2 17 5½
8	1 0 13	1 1 4	1 1 25	1 2 6	—	10	21	9	—	49	119	1 1 24	10	10 6	2 15 6½
9	1 0 21	1 1 10	1 2 3	—	—	17	21	—	—	38	98	1 1 23	8	10 3	2 13 7
10	1 0 13	1 1 16	1 2 10	—	—	31	22	—	—	53	98	1 2 3	7	10 6	2 15 6½
11	1 0 7	1 1 0	1 1 22	—	1 2 11	21	22	—	17	60	142	1 2 3	8	11 2	2 18 1½
12	1 0 19	1 1 17	1 2 10	—	1 3 4	26	21	—	22	69	142	1 2 20	12	12 4	3 4 7
13	1 0 14	1 1 12	1 2 3	1 2 15	—	26	19	12	—	57	119	1 2 7	8	10 6	2 15 6½
14	1 0 12	1 1 9	1 2 1	—	—	25	20	—	—	45	98	1 1 24	5	10 4½	2 14 6½
15	0 3 26	1 0 21	1 1 13	—	—	23	20	—	—	43	107	[1]	—	10 1	2 12 3½
Total of fifteen sheep	16 1 27	19 1 10	22 0 8	—	—	319	306	—	—	738	—	20 2 23	113	159 7½	41 6 2
Average per sheep	1 0 11	1 1 4	1 1 25	—	—	21$\frac{4}{14}$	20$\frac{2}{5}$	—	—	49$\frac{1}{5}$	—	1 1 25$\frac{8}{14}$	8$\frac{1}{14}$	10 5$\frac{3}{10}$	2 15 1

Gain per head daily during whole period . . . ·425 lb. Percentage of carcass to fasted live weight . . . 51·68.

[1] Died March 16. [2] Estimate. [3] Fourteen sheep only.

TABLE V.—*Live Weights of the Sheep at each Period, Gains in Live Weight, Fasted Live Weights, Carcass Weights, &c.*

PEN III.—SHEEP ON MEADOW HAY CHAFF AND OAT STRAW CHAFF.

No.	Live weights					Gain in live weight					Total number of days fattening	Fasted live weight	Loss by fasting	Carcass weight	Price realised
	Nov. 29, 1897	Jan. 18, 1898	March 7	March 28	April 20	In 50 days	In 48 days	In 21 days	In 44 days	In total period					
	c. q. lb.	c. q. lb.	c. q. lb.	c. q. lb.	c. q. lb.	lb.	lb.	lb.	lb.	lb.		c. q. lb.	lb.	st. lb.	£ s. d.
1	1 0 26	1 2 1	1 2 22	—	—	31	21	—	—	52	98	1 2 16	6	12 0	3 2 0
2	1 1 6	1 2 6	1 2 25	—	—	28	19	—	—	47	98	1 2 23	2	12 3	3 3 11
3	1 0 9	1 0 25	1 1 17	—	—	16	20	—	—	36	98	1 1 10	7	9 4	2 9 1
4	1 0 7	1 0 23	1 1 18	1 1 27	—	16	23	9	—	48	119	1 1 18	9	10 2	2 12 11½
5	1 0 14	1 1 8	1 1 27	1 2 10	—	22	19	11	—	52	119	1 1 25	13	11 0	2 16 10
6	1 0 5	1 1 3	1 1 24	1 2 8	—	26	21	12	—	59	119	1 1 25	11	10 7	2 16 2
7	1 0 13	1 1 16	1 2 0	—	1 2 27	31	12	—	27	70	142	1 2 16	11	12 2	3 3 3½
8	0 3 27	1 0 26	1 1 20	—	1 2 1	27	22	—	9	58	142	1 1 21	8	11 0	2 16 10
9	1 0 6	1 0 25	1 1 13	—	1 2 2	19	16	—	17	52	142	1 1 22	8	10 1½	2 12 7½
10	1 0 18	1 1 18	1 2 6	1 2 18	—	28	16	12	—	56	119	1 2 7	11	11 4	2 19 5
11	1 0 4	1 1 0	1 1 20	1 2 1	—	24	20	9	—	53	119	1 1 19	10	11 1	2 17 5½
12	1 0 8	1 1 0	1 1 17	—	1 2 4	20	17	—	15	52	142	1 1 24	8	10 2½	2 13 3
13	1 0 2	1 1 0	1 1 5	—	—	26	5	—	—	31	98	1 1 3	2	9 1	2 7 1½
14	1 0 11	1 1 6	1 1 27	—	—	23	21	—	—	44	98	1 1 21	6	10 6	2 15 6½
15	1 0 14	1 1 11	1 2 6	—	—	25	23	—	—	48	98	1 1 27	7	10 7½	2 16 6
Total of fifteen sheep	16 2 2	19 3 0	22 0 23	—	—	362	275	—	—	758	—	22 0 23	119	163 1½	42 3 0
Average per sheep	1 0 11	1 1 7½	1 1 26	—	—	$24\frac{2}{15}$	$18\frac{1}{3}$	—	—	$50\frac{8}{15}$	—	1 1 26	$7\frac{14}{15}$	10 7	2 16 0

Gain per head daily during whole period . . . ·433 lb. Percentage of carcass to fasted live weight . . . 52·49.

TABLE VI. *Live Weights of the Sheep at each Period, Gains in Live Weight, Fasted Live Weights, Carcass Weights, &c.*

PEN IV.—SHEEP ON DRILD GRAINS.

No.	Live weights: Nov. 29, 1897	Live weights: Jan. 15, 1898	Live weights: March 7	Live weights: March 28	Live weights: April 20	Gain in live weight: In 50 days	Gain in live weight: In 45 days	Gain in live weight: In 21 days	Gain in live weight: In 14 days	Gain in live weight: In total period	Total number of days fattening	Fasted live weight	Loss by fasting	Carcass weight	Price realised
	c. q. lb.	c. q. lb.	c. q. lb.	c. q. lb.	c. q. lb.	lb.	lb.	lb.	lb.	lb.		c. q. lb.	lb.	st. lb.	£ s. d.
1	1 0 1	1 1 [illegible]	1 2 5	1 2 4	—	30	18	1	—	17	11[illegible]	1 1 21	5	10 [illegible]	2 15 [illegible]
[illegible]	1 0 1	1 1 8	1 2 4	1 2 16	—	23	24	12	—	[illegible]	11[illegible]	1 [illegible] 6	10	11 4	2 19 [illegible]
[illegible]	1 1 0	1 1 22	1 2 8	—	—	2[illegible]	14	—		6	[illegible]5	1 [illegible] 0	5	11 0	2 1[illegible] 10
4	1 0 0	1 0 2[illegible]	1 1 20	—	1 1 16	25	[illegible]	—	[illegible]	46	1[illegible]	1 1 14	4	10 4	2 14 3
5	1 0 18	1 1 16	1 2 6	—	—	26	18	—	—	44	98	1 1 7	[illegible]	10 [illegible]	2 15 6[illegible]
[illegible]	0 3 24	1 0 2[illegible]	1 1 16	1 2 1	—	26	24	11	—	61	11[illegible]	1 1 21	8	[illegible]	2 5
7	1 0 15	1 1 11	1 2 5	—	1 2 16	24	22	—	11	[illegible]	11[illegible]	1 2 6	10	11 1	[illegible] 1 5
8	1 0 18	1 1 1	1 1 27	—	1 2 1	2	14	—	2	[illegible]	11	1 1 [illegible]		11 1	2 18 [illegible]
9	1 0 1	1 0 [illegible]	1 1 17	—	—	2[illegible]	16	—	—	41	95	1 1 10	[illegible]	10 1	2 12 3[illegible]
10	1 0 [illegible]	1 0 7	1 1 2	—	—	21	24	—	—	4[illegible]	9[illegible]	1 1 16	7	10 1	2 1 3[illegible]
11	0 3 [illegible]3	1 0 1[illegible]	1 1 0	—	1 1 11	20	19	—		44	1[illegible]	1 1	8	[illegible]	2 8 5
12	1 0 18	1 1 [illegible]2	1 2 5	—	—	[illegible]2	11	—	—	4	[illegible]8	1 1 21	9	1[illegible] 7	[illegible] 16 2
1[illegible]	1 0 16	1 1 18	1 2 20	—	—	[illegible]0	[illegible]0		—	60	[illegible]8	1 [illegible] 1[illegible]	5	11	[illegible] 18 [illegible]
14	1 0 11	1 1 7	1 1 13	1 1 1	—	24	[illegible]	—	—	[illegible]0	119	1 1 [illegible]	6	9 9	2 7 [illegible]
15	1 0 20	1 1 22	1 2 22	1 1	—	30	28	7	—	6[illegible]	119	1 2 9		12 7	3 6 6
Total of fifteen sheep	16 2 3	19 3 18	22 2 3	—	—	379	293	—	—	717	—	1 3 16	114	161 2	41 1 11
Average per sheep	1 0 11	1 1 9	1 2 [illegible]	—	—	25[illegible]	19[illegible]	—	—	[illegible]	—	1 1 [illegible]	[illegible]	10 6	[illegible] 1 6

Gain per head daily during whole period . . . 409 lb. Percentage of carcass to fasted live weight 2[illegible]

During the first and second periods, fifty days and forty-eight days, of the experiment the respective gains were :—

—	1st period, 50 days	2nd period, 48 days	Total, 98 days
	lb.	lb.	lb.
Pen I. Oat straw	325	286	611
„ II. Hay	319	306	625
„ III. Hay and oat straw	362	275	637
„ IV. Dried grains	379	293	672

In the first period of fifty days, the gains were very good all round with the exception of one sheep (No. 2) in Pen II., which was noticed to be unwell for a time. In the second period there was one case of low gain in Pen III. (No. 13), and one in Pen IV. (No. 14). With these exceptions the gains rose very satisfactorily. The best result up to the weighing on March 7 was obtained with the dried grains (Pen IV.); next to it came Pen III., the hay and oat straw mixture; and the poorest increase was got from Pen I., the oat straw chaff alone. This, it will be remembered, quite corresponded with the judgment passed upon the sheep by Mr. Terry when he examined them on February 22, and selected the ones that were to be killed first. Taking, however, into account only the six sheep of each pen which were then judged to be fat and ready to kill, and which were killed a few days later (March 8), and so closed the experiment as far as they were concerned, there was comparatively little difference between the gains in live weight. These were —for the six sheep of each pen killed on March 8 :—

—	Gain in live weight
	lb.
Pen I. (Oat straw)	257
„ II. (Hay)	267
„ III. (Hay and oat straw)	258
„ IV. (Dried grains)	269

During the third and fourth periods, March 7 to 28 (twenty-one days) and March 28 to April 20 (forty-four days), we have the following increase of live weight :—

—	Pen I. (Oat straw)	Pen II. (Hay)	Pen III. (Hay and oat straw)	Pen IV. (Dried grains)
	lb.	lb.	lb.	lb.
Third period, 21 days, five sheep	34	87[1]	53	29
Fourth period, 44 days, four sheep	65	76	68	16

[1] Four sheep only.

This brings out very clearly the fact that the sheep of Pen IV. (dried grains) did very little good by keeping them on longer, whereas the other three lots increased materially in the final stage.

This, however, as already pointed out, may have been due largely to the snowstorms at the end of March which affected the sheep of Pen IV. more than the rest.

The following tabular statement sets out the main points of comparison, as regards the whole period, derivable from Tables III. to VI.:—

—	Pen I (Oat straw)	Pen II. (Hay)	Pen III (Hay and oat straw)	Pen IV. (Dried grains)
	lb	lb	lb	lb.
Gain per head daily . .	·405	·425	·433	·409
Percentage of carcass to live weight	51 84	51 68	52·19	52 56
	£ s d	£ s d	£ s d	£ s d.
Price realised per pen of fifteen sheep . . .	40 17 5½	41 6 2	42 3 0	41 12 11

Thus, the highest gain came from Pen III. (hay and oat straw), the best carcasses were those of Pen III. and Pen IV. (dried grains), the highest price realised was for Pen III., while in all three respects Pen I. (oat straw) fell lowest.

It remains now to see at what cost these results were obtained. The cheapest food, of course, was the oat straw, the dearest the dried grains. Turning back to Table II. we see that the largest consumption of roots was in Pen I. (oat straw), the smallest in Pen IV. (dried grains). The cost of the food consumed in each pen is given in Table VII.

TABLE VII.—*Cost of Food consumed in each Pen during the entire Experiment.*

—	Pen I. (Oat straw chaff)	Pen II. (Hay chaff)	Pen III. (Hay and oat straw chaff)	Pen IV (Dried grains)
	£ s d.	£ s d	£ s d.	£ s d.
Roots . . .	6 18 0	6 14 9	6 16 0	6 12 0
Linseed cake . .	4 6 2	4 5 5	4 6 2	4 6 2
Oat straw chaff	0 8 10	—	0 9 5	—
Hay chaff . .	—	0 17 2	0 4 7	—
Dried grains . .	—	—	—	1 6 11
Total . .	11 13 0	11 17 4	11 16 2	12 5 1

Taking now the actual money received by the sale of each pen, and deducting the original cost—40*s.* 6*d.* per head—of the sheep when the experiment began, we have:—

—	Pen I.			Pen II.			Pen III.			Pen IV.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Price realised (fifteen sheep).	40	17	5½	41	6	2	42	3	0	41	12	11
Original cost (fifteen sheep).	30	7	6	30	7	6	30	7	6	30	7	6
	10	10	0	10	18	8	11	15	6	11	5	5
Deduct cost of food as per Table VII.	11	13	0	11	17	4	11	16	2	12	5	1
	1	3	0	0	18	8	0	0	8	0	19	8

So far no account has been taken of the manure value of the food consumed, which must, of course, be set against the seeming loss. But it is already clear that, inasmuch as the linseed cake consumed in each pen was alike in quantity, the greatest difference between the roots consumed was only 17 cwt. (the compensation value of which would be only 1*s.* 3*d.*), and that the fibrous foods consumed amounted to only 6 cwt. at the most (the compensation value of which in the case of the richest food, dried grains, would be only 6*s.*), the general relation set out in the last table cannot be materially modified, and that the best result was shown by Pen III. (hay and oat straw). However, to take the compensation values for the manure, as set out in Lawes' and Gilbert's latest (December, 1897) tables (Note.—*One-half* the original manure value only), and assigning to dried grains (not mentioned in the tables) the original manure value of about 2*l.* per ton which its composition would give to it, we have :—

Compensation value.	Pen I.			Pen II.			Pen III.			Pen IV.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Roots, at 1*s.* 6*d.* per ton consumed	1	9	6	1	8	10	1	9	1	1	8	4
Linseed cake, at 26*s.* ,,	0	13	0	0	13	0	0	13	0	0	13	0
Oat straw, at 3*s* 9*d.* ,,	0	1	0		—		0	1	9		—	
Meadow hay, at 9*s.* 4*d.* ,,		—		0	2	6						
Dried grains, at 20*s.* ,,		—			—			—		0	6	0
	2	3	6	2	4	4	2	3	10	2	7	4
Deduct excess of cost of food over price realised (as per last Table)	1	3	0	0	18	8	0	0	8	0	19	8
Gain . .	1	0	6	1	5	8	2	3	2	1	7	8

This result shows that the most profitable feeding was that of Pen III. (hay and oat-straw chaff), that Pen IV. (dried grains) and Pen II. (hay chaff) were about equal, and that Pen I. (oat straw chaff alone) gave the poorest result.

In making these comparisons it has to be borne in mind that

the money values put upon the roots, the oat-straw chaff, and the hay chaff are only estimates, and these may well be reduced in particular cases, seeing that the foods are home-produced, whereas in the case of the dried grains the actual prices put down had to be paid.

It was abundantly clear, however, that the sheep did exceedingly well on the dried grains, and liked the food greatly; also that hay could be entirely replaced by dried grains, a result different from that obtained in a similar experiment on bullocks recorded at p. 768. But it cannot be said that the feeding with dried grains was more profitable than with hay chaff, while a mixture of hay chaff and oat straw chaff, half and half, proved to be the most economical feeding.

The question of the profitable employment of dried grains for fattening sheep must, clearly, depend upon whether the price of the grains greatly exceeds that of hay or not.

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Notes, Communications, and Reviews.

THE CLOSE-DRESSING OF MALTING BARLEY.

In a paper on English malting barley (abstracted in this Journal)[1] which I read a few years ago before the Institute of Brewing, I drew attention to the serious injury done to barley, from a malting and brewing point of view, by the then prevalent custom of dressing it over-closely in the threshing machine. I regret that I cannot credit my remarks with having effected any good, for the practice is as prevalent—and, I think, more prevalent—to-day than it was then, and I am inclined to think that no barley in recent years has been so much injured in this way as that harvested south of the Trent during the past very dry season. Grave complaints have reached me, from many influential quarters, that south-country barley free from this defect is not to be got in any quantity; and this year the difficulty of dealing with such barley has been aggravated by the close warm weather which has prevailed almost uninterruptedly since the commencement of the malting season. In such weather, abraded, cut, or short-ended corns show a more than usual readiness to contract mould on the floors. I am, of course, aware that there are some brewers and maltsters who do not know their business, who are attracted by the fictitious plumpness and "shortness" which over-close dressing produces, and it is perhaps wrong to blame the farmer for doing that which meets with apparent approval on the part of some of his customers. But I rather doubt whether, even in dealing with the ignorant minority, the farmer is studying his best interests in so meeting their views; for the injured barley will prove unsatisfactory on the malting-floors and ultimately in the brewhouse. As a consequence there will be a tendency, in subsequent seasons, to an increased demand by the brewer for thin foreign barleys and for malt substitutes, and any such increased demand (especially for foreign barleys) must have its effect upon prices. By the latter remark I do not mean to imply that the foreign farmer is blameless in the matter of dressing. He

[1] *The Alleged Deterioration of English Malting Barleys.* By E. R. Moritz, Ph.D., F.I.C., F.C.S., Analyst and Scientific Adviser to the Country Brewers' Society. Journal R.A.S.E., 3rd Series, Vol. VI., 1895, p. 373.

is very much the reverse; but the fact is that thin foreign barleys (and these constitute the bulk of foreign barleys malted) are not injured so seriously as ours by over-dressing, because of their different conformation and tougher husk.

I have shown elsewhere that the need for foreign malt and substitutes in brewing is a varying need, differing much with the quality of the English malt, as determined (1) by the quality of the barley, and (2) by the system of malting pursued, and I have shown that the slower the barley is grown on the malting-floors the better the malt, the sounder the beer, and the less the extent to which such malt is advantageously replaced by foreign malts and substitutes. It is, therefore, clearly to the ultimate pecuniary advantage of the farmer that the maltster should perform his part of the business properly. But, while the great majority of maltsters have proved themselves ready to incur the extra expense and trouble of malting slowly in the proper manner, they find themselves utterly unable to do so when the barley supplied to them is injured in the machines, for the corns which have been abraded, or cut,[1] or from which the ends have been nipped too closely, commence to mould several days before the pieces are ripe for the kiln, and then the maltster has to select one of the following very unsatisfactory alternative courses. The first plan is to load the kiln directly the mould appears, and before the corn is really ripe; the malt so produced is hard and steely, yielding a thin characterless beer. The second course is to keep the malt on the floor the full time, and ignore the mould; a material is then produced which is only saleable at some shillings per quarter below its worth in other respects, and such malt will produce a fusty-flavoured and badly keeping beer. The third course—the most usual one—is for the maltster to hurry through or "force" his flooring process so that the malt may be ripe for loading some days earlier than would otherwise be the case, and before the mould obtains any hold. In that case the malt produced may be tender and free from mould, but it gives an unsound beer. Now, there are no real remedies for dealing in the brewery with malt of these three kinds, but there are palliatives—viz. foreign malt and brewing sugar in increased quantities. It is, in fact, not too much to say that it is impossible for a maltster to do his work properly with barley that is seriously injured, and every quarter of such barley converted into malt constitutes a direct encouragement of the foreign barley grower and of the manufacturer of malt substitutes.

In the paper to which I have referred I attributed the injury wholly to a wrongful use of the existing machinery. From opinions which have reached me, which I cannot disregard, I am led, however, to think that perhaps the machinery itself may be to blame for the abrasion and cutting, though I do not see how it can be

[1] I need not dwell further upon cut corns, as these are mechanically removable before the barley is malted, although at an appreciable expense per quarter.

responsible for snipping off the ends too short. Still, abrasions and cutting of the corn are in themselves serious injuries, and if the existing machinery cause them, even when properly handled, it is time some improvements were introduced by our agricultural engineers. Into this aspect of the question I do not, however, propose to enter, for its thorough investigation would entail more work and time than I can at present devote to it. My remarks are intended to call attention to the great harm done, in the hope that it will lead others to devise means for averting or reducing it.

In conclusion I may cite, as an instance of the prevalent over-close dressing of this year's barleys, the very large number of corns, with ends which I considered cut off too short, contained in some samples sent to me of barleys which took prizes at the recent competition at the Agricultural Hall. In the sample of 1st prize barley (Northampton), I find 50 per cent. of such corns; in the 3rd prize (Berkshire), 56 per cent.; in the 2nd prize (Essex), 73 per cent. The lowest proportion was 16 per cent. in the 1st prize (Smyrna). I did not attend the competition, and I have only seen a few of the winning samples, so that my remarks must not be held to reflect upon the samples generally. But the close-dressing of the above few samples does not astonish me after what I have this season seen and heard at first hand.

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SOME TOXICOLOGICAL ASPECTS OF MILDEW.

THE following report[1] of poisonous effects produced on men engaged in chaffing mouldy hay is not claimed as a unique or isolated experience, but within my memory no statement or public intimation has been previously given marking the occupation as attended with danger to health.

In March 1889, five workmen and myself commenced cutting up about $2\frac{1}{2}$ tons of clover hay from a mouldy rick, previously to having it steamed in a Barford & Perkins steaming apparatus. Before starting, the men were warned to tie handkerchiefs over their mouths, and to breathe only through their nostrils. The engine and cutter ran from 1 P.M. to 5.30 P.M. Considerable volumes of white mildew dust came off during the operation, penetrating the whole building, which was large (48 ft. by 24 ft. by 11 ft.) and amply ventilated. Two to three hours after ceasing work three of the men and myself were seized with extreme chilliness and great prostration, combined with severe pains in the head, neck, back, and legs. There was also giddiness and disinclination to eat or sleep, followed by semi-unconsciousness. In

[1] By Samuel Walkden, in the Journal of the Sanitary Institute, Vol. XIX., Part III.

all cases recourse was at once had to repeated doses of whisky, and in twelve hours from the incidence of the attack recovery set in; at the termination of twenty-four hours convalescence was complete. The two men who felt no ill results that day, immediately on leaving work took strong aperient medicine, but on the second day similar signs of ailing were apparent, though the invasion was milder, and continuation shorter. No after evils were evident. In conclusion, I think it only fair to mention that influenza had previously occurred in the district to a small extent, and it may be argued that the above subjective symptoms simulate some of those which have occasionally been prominent in the initial stages of that disease. Whether there may exist any resemblance between the organisms associated with mildew and those companionable with influenza I am unprepared to say, but that these six cases referred to arose solely from mildew poisons I think is indicated by the fact that other workmen on the same premises not connected with the mildew dust remained perfectly unharmed.

THE AUTUMN OF 1898.

In dealing with the weather of last spring (this volume, Part II., p. 417), attention was drawn to the singular manner in which the seasons often bid defiance to the rigid limits imposed by the calendar. The winter of 1897–98 was, it will be remembered, unduly mild, but in March, when temperature should have been taking an upward turn, the weather became unusually cold, the early part of the spring being, in fact, more inclement than either of the two preceding winter months. A very similar state of things appears to have prevailed last summer, for although there was plenty of warmth in August the highest temperatures of the year occurred in the early days of autumn, when the thermometer rose to a higher level than it had hitherto reached at so advanced a period for at least thirty years past. The phenomenal burst of heat experienced early in September was, of course, not maintained, but over the country generally the weather remained warm and dry until the close of the month, the only material exceptions occurring about the 11th and 17th, when thunderstorms occurred in some few places.

At Michaelmas a cyclonic disturbance, which passed south-eastwards across Ireland and England, occasioned very general rains, but after this the weather again quieted down, the earlier half of October being mild and dry, though for the most part dull and misty. Towards the middle of the month, however, a change set in of a sufficiently decided character to serve as the boundary mark between the long drought of 1898 and the rainy period we have since experienced. The break in the weather was due, in the first place, to a well-marked cyclonic area which advanced very slowly to our south-west coasts between the 14th and 16th, and which afterwards moved in a rather erratic way over England to the Irish Sea,

where the disturbance finally dispersed. During its progress stiff gales from various directions were experienced on all our coasts, with heavy rain in most places, and especially in the south-western and north-eastern parts of the country, where the total amount in five or six days was in several instances more than the average for the whole month. From this time onward to the early days of November the weather continued in a very unsettled state, further heavy falls of rain being reported in many parts of England and Wales on October 28 and 29, and in the north-western district between November 1 and 3. On the evening of October 29 thunderstorms occurred in the south-east of England, while a portion of Camberwell (South London) experienced the devastating effects of a small tornado of sufficient violence to level trees and carry away portions of buildings.

The stormy period at the commencement of November was followed by a fortnight or so of quiet misty weather, broken only by a short rainy period at about the end of the second week. Towards the close of the month, however, the country was affected in very much the same way as in October by a slow-moving cyclone, the centre of the disturbance advancing in this case south-eastwards over our western coasts, and hovering for some time in the neighbourhood of the south-western districts. Another period of very wet weather was therefore experienced generally, the rainfall in the northern and central parts of the country being preceded by snowstorms of considerable severity. Later on fresh areas of disturbed weather appeared, first of all, in the south, and, afterwards, in the north, so that the quarter ended very stormily, the appearance of snow and frost in many places showing that the autumn was fast retiring in favour of winter.

The leading features in the weather of last autumn are shown in a statistical form on p. 792, the following remarks giving further details of interest in the history of each particular element.

Temperature.—The mean temperature was above the average in no fewer than nine weeks out of the thirteen, the excess being very considerable during the earlier half of September and the latter half of October. In two other weeks, viz., those ending September 3 and October 15, the readings agreed fairly with the normal, while in the last weeks both of September and November, the thermometer was below its average height. Taking the season as a whole, the mean temperature was greatly above the average, the excess varying from between three and a half and four degrees in the western and south-western districts, including the Channel Islands, to more than four and a half degrees in the eastern and southern counties. As a rule, the difference from the average was much greater in the day-time than at night, this being especially the case over the eastern counties and the Channel Islands; in the latter district the excess of warmth was nearly twice as great in the one case as in the other. A comparison with previous records shows that the autumn was by far the warmest experienced over England for many years past. Over the country generally there was certainly no such autumn in

Temperature, Rainfall, *and* **Bright Sunshine** *experienced over* **England** *and* **Wales** *during the Thirteen Weeks ended November* 26, 1898.

(*The Autumn Season.*)

Districts	Temperature							
	Highest observed	Lowest observed	Day temperatures		Night temperatures		Day and night temperatures combined	
			Mean	Difference from average	Mean	Difference from average	Mean	Difference from average
	°	°	°	°	°	°	°	°
North-eastern counties	85	25	58·6	+4·9	46 6	+3·5	52·6	+4·2
Eastern counties	92	25	61·5	+5·5	46·2	+3·6	53·9	+4·6
Midland "	90	23	59·9	+4·5	45·0	+3·4	52·5	+4·0
Southern "	91	26	62·1	+5·0	48·9	+4·4	55·5	+4·7
North-western counties, including North Wales	81	26	58·4	+3·7	47·8	+3·4	53·1	+3·5
South-western counties, including South Wales	87	25	60·5	+4·2	48·6	+3 4	54·6	+3·8
Channel Islands	84	34	63·1	+5·1	52·6	+2·7	57·9	+3 9

Districts	Rainfall				Bright Sunshine			
	Days with rain		Total fall		Duration		Percentage of possible amount	
	Number	Difference from average	Amount	Proportion of average amount	Hours recorded	Difference from average	Percentage	Difference from average percentage
			ins.	per cent.				
North-eastern counties	43	−8	7·0	89	247	−19	25	−2
Eastern counties	34	−16	5·1	65	399	+49	41	+5
Midland "	39	−10	6·7	80	302	+6	31	+1
Southern "	37	−12	7·1	76	391	+43	40	+5
North-western counties, including North Wales	51	−4	8·7	76	273	−6	28	−1
South-western counties, including South Wales	51	−4	11·3	90	379	+18	39	+2
Channel Islands	54	−6	8·6	77	478	+77	48	+7

NOTE.—The above Table is compiled from information given in the Weekly Weather Report of the Meteorological Office. The averages employed are: For Temperature, the records made during the twenty-five years, 1871–95; for Rainy Days, the values for the fifteen years, 1881–95; for Total Rainfall, those for the thirty years, 1866–95; and for Bright Sunshine, those for the fifteen years, 1881–95.

any of the past five and twenty years, and from the long series of observations made at Greenwich, it is clear that in the neighbourhood of London the season was the warmest experienced for more than fifty years past. At Greenwich the nearest approach to so mild an autumn occurred in the years 1857 and 1865, but in each of these instances the mean temperature was about a degree and a half lower than in 1898. The highest temperatures of last autumn occurred on September 8, when the thermometer rose to 85° and upwards in all districts excepting the north-western and the Channel Islands. At several stations in our eastern, midland, and southern counties the shade readings on this day were as high as 90°, or slightly above it, the reading of 91° in London being the highest recorded there in September since the year 1868. Over the whole of the regions just named the absolute maxima were far higher than those recorded in any recent autumn, but in the western and south-western districts readings as high, or even a little higher, were registered in the season of 1895. The lowest temperatures of the autumn occurred, as a rule, on November 22 or 23, when the sheltered thermometer fell to nine degrees below the freezing point in the midland counties, and to six or seven degrees below it in all other districts excepting the Channel Islands, where the lowest reading was only 34°. The readings at this time were in many cases a little lower than those recorded during the autumns of 1897 and 1894, but were a trifle higher than in the autumn of 1896, and considerably higher than in 1895. In addition to the sharp frost at the end of November, others of a slighter and more partial character were experienced at earlier times in the same month, and also at the close of September. In October there was an almost entire absence of frost, excepting once or twice on the surface of the ground.

Rainfall.—During the earlier half of the season the weather was extremely dry, the total rainfall for the first seven weeks being considerably less than half the average over the whole country. In the midland and southern counties the amount was less than one-third, and in the eastern counties less than one-fourth of the ordinary quantity. The number of rainy days was also very small, especially in the east and south, where they did not amount to nearly one-half the average. During the first three weeks in November there was again a general deficiency of rain, but in the third week of October, and also in the fourth week of November, there was a very large excess, the heavy downpour at these times being due in each case to the presence in our neighbourhood of one cyclonic disturbance moving slowly and in a rather erratic course. The figures in the table show that as a whole the autumn was extremely dry, the total rainfall being at least 10 per cent. short of the average in the north-eastern and south-western parts of the country, and at least 20 per cent. short in all other districts. In the southern and in the north-western counties there was a deficiency of 24 per cent., while in the eastern counties the autumn rains amounted to less than two-thirds of the average. As regards frequency, the figures also showed a

great falling off, especially in the eastern, midland, and southern counties. In many parts of England the autumn was scarcely so dry as that of 1897, and in the south it was not nearly so dry. It was in nearly all places drier than in most other recent years, but in some parts of our eastern and midland counties there was more rain than in the autumn of 1893. A review of the rainfall conditions prevailing throughout the whole twelve months ending with November shows that the aggregate amount for the year was 3 per cent. in excess of the average in the north-west of England, and only 8 per cent. below it in the south-west. In all other districts there was a deficiency of at least 15 per cent., and in the midland counties of nearly 20 per cent., while in the eastern and southern counties the total for the year was very little more than three-fourths of the normal. The driest portions of the year were the summer and autumn months; in the spring there was, in most places, an excess of rain, due mainly to the extreme wetness of May. The heaviest rains of last autumn occurred respectively between October 14 and 19, and between November 22 and 25. In the former case the aggregate amount for the six days exceeded 3 inches at many places in the north-eastern and south-western parts of Great Britain, the largest amounts reported in the former district being 4·2 inches at Marchmont (Berwickshire) and 3·8 inches at Durham; and in the latter district 5·8 inches at Chepstow (Monmouthshire), 4·5 inches at Arlington (North Devon), and 4·2 inches at Clifton. In November the fall was more generally heavy than in October, but the individual amounts were in no case so large. The highest aggregates for the four days—22nd to 25th—were recorded in the western and south-western districts, and ranged in many places between 2½ and 3 inches. In the neighbourhood of Dublin the latter amount was greatly exceeded, Bray having nearly 4¾ inches. In addition to the instances just mentioned, there were several others in which the daily rainfall exceeded an inch over a considerable area, the most important being :—(1) On September 29 in the western and south-western districts; (2) on October 28 and 29 in many parts of England and Wales; (3) between November 1 and 3 in the west of Scotland and north-west of England, the fall in this case resulting in serious floods, especially in the Lake districts; (4) on November 26 in the east of England. Snow fell in most districts on November 22 and 23, the amount being considerable over the northern and midland counties, and showers of snow or sleet were experienced in many places between the 27th and 29th.

Bright sunshine.—In September, and also in the first week of November, the duration of sunshine was in excess of the average. At nearly all other times, however, there was a deficiency, the only exceptions occurring during the second week of November, when the amount was rather variable, and in the following week, when the southern counties enjoyed rather more than their due share. Taking the season as a whole, the figures in the table show a slight deficiency in the two northern districts, but an excess in all other

parts of the kingdom. In the midlands the excess was very trifling, but in the eastern and southern counties, and also in the Channel Islands, it was rather large, the mean daily amount in the last-mentioned district being quite fifty minutes more than the average. Over the north of England the autumn was less sunny than in 1897, but over the country generally it was the brightest experienced in any recent year, with the exception of 1895, when the duration was, as a rule, greater than in 1898.

THE GEOLOGICAL SURVEY OF ENGLAND AND WALES.[1]

THE subjoined excerpts from the Annual Report for 1896 of the Director-General of the Geological Survey (Sir Archibald Geikie, LL.D., F.R.S.) are such as relate to subjects of agricultural or other economic interest.

CRETACEOUS.

Large tracts of Cretaceous rocks have been revised in the course of the year, and the various subdivisions of the Chalk now mapped have been traced on the ground.

North Downs.—Mr. William Hill, who is giving the Survey his assistance in collecting material on the ground for the preparation of the General Memoir on the Cretaceous System, has examined the outcrop of the Upper Cretaceous series, not including the Upper Chalk, along the whole length of the North Downs, from Folkestone to Alton in Hampshire, with the exception of a short distance between Folkestone and Wye. He has taken detailed measurements of every important section. He finds that while the Lower Gault appears to maintain its usual proportions, the Upper Gault thickens considerably near Maidstone. Although it is difficult to follow inland the smaller subdivisions of the Folkestone Gault, as described by Messrs. De Rance and Price, the fossiliferous Folkestone type of this division continues until the Upper Greensand fairly sets in, when the Gault slightly alters in its nature, and its fossils (especially in the upper part) rapidly diminish in number.

The Upper Greensand first appears as a marly glauconitic sand near Kemsing; about three-quarters of a mile west of Alford it can be seen to be at least 4 or 5 feet thick. Further west it increases rapidly, the thickening taking place probably at the expense of the Upper Gault. The Malm rock is first seen at some springs near Court Lodge Farm, about one and a half miles north-north-east of Westerham.

From his brief examination of the Lower Chalk between Folke-

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[1] The Work of the Geological Survey was described in this Journal, 3rd series, vol. v., 1894, pp. 140–162.

stone and Dover, Mr. Hill concludes that the description of this portion of the series given by Mr. Price in his paper on the Lower Chalk of Folkestone needs some revision. The Melbourn rock with the underlying marly chalk (the zone of *Belemnitella plena*, which occurs plentifully everywhere), is continuous through Kent and Surrey, but near Alton in Hampshire it has not yet been satisfactorily identified.

Although no definite bed of Chalk rock has been noted, the zone of *Holaster planus* is well marked through Kent and Surrey. Very hard rocky beds occur above the zone of *Holaster planus*, which must not be confounded with the true Chalk rock.

There yet remain for investigation in this area, the Upper Chalk of Rochester and Croydon, and the Chalk of Margate.

Pleistocene and Glacial.

The various superficial deposits continue to be mapped at the same time with the older rocks underneath them. During the year numerous observations have been recorded respecting these deposits over a large part of the United Kingdom.

South Wales.—In South Wales the Glacial drifts have been traced over a considerable area of the high Carboniferous plateau and among the valleys by which it is trenched. These deposits have been found by Mr. Gibson to be well developed among the uplands in the northern part of Sheet 248. They present the usual character of gravelly Boulder Clay, or roughly stratified gravel, the one shading laterally into the other. Generally the material is of strictly local origin; but a notable exception occurs in the Fforch Dwm Valley, where boulders of Old Red Sandstone and Millstone Grit, frequently scratched, together with some of Carboniferous Limestone, have been brought southwards and left in profusion on the Coal Measures. Not only is the drift thick, but it runs far up the slopes of Mynydd Nant-y-Var, over which are also scattered great erratics of Millstone Grit, ranging up to 10 feet in length. This drift can only have been derived from ground lying far to the north, and must in its passage have crossed the deep Vale of Neath. This valley also, south of Aberdylais, contains abundance of pebbles of Old Red Sandstone and Carboniferous Limestone, imbedded in thick masses of gravel and sand.

West of the head of the Rhondda, Mr. Gibson has noted isolated patches of Boulder Clay of local origin, with scratched blocks, at a height of 1,600 feet above the sea. Near Cymmer railway station he has observed striæ on rock in place, trending N.N.W.–S.S.E., diagonally across the main Avan Valley, and others near Castell-fforch-nant trending N.E.–S.W. at an elevation of 860 feet. The latter direction is unusual, and has probably been due to some deflection of the ice owing to the form of the ground.

The Llantwit basin and much of the ground north and west of it, together with other broad low-lying tracts, have been found by Mr. Strahan to be thickly overspread by Boulder Clay, composed of Pennant and other Coal Measure rocks. The deposit passes locally

into pebble gravel, and more often along the principal stream courses than elsewhere, a fact which suggests that some of the chief lines of drainage were initiated while the deposition of the drift was still in progress.

Dorset.—In the course of his recent field-work in Dorset, Mr. Clement Reid has ascertained that this county bears out the conclusion arrived at during the mapping of the Downs of Hants and Sussex, that the Clay-with-flints in England is essentially a *remanié* deposit derived from Eocene or other strata above the Chalk. The invariable occurrence in it of considerable quantities of rounded quartz sand shows that it cannot have arisen from solution of the Chalk, as it is said to have done in France. It usually contains likewise pebbles undoubtedly derived from Eocene strata, as well as masses of Sarsen stone. Its distribution is also singularly partial, and commonly, though not invariably, it is confined to districts where outliers of Tertiary strata still occur. Watersheds and isolated hills of Chalk, on the other hand, have a capping of a few feet of unworn flints, apparently derived from the Chalk by solution. But wherever the catchment area and slope would allow running water to obtain any power, at a period when the Chalk was frozen and impervious, the loose flints have mostly been swept away to form "Coombe rock" or valley gravel. Certain narrow ridges and outliers of the flintless Middle Chalk are capped with loose flints of peculiar character, known to belong to the lower 50 feet of the Upper Chalk. These apparently have been let down by solution of the Chalk, sometimes as much as 100 feet. The process in such places may have been continuous since the latest submergence, in older Pliocene times.

When the wide sheets of chalky gravel, known in Sussex as "Coombe rock," were described by Mr. Clement Reid, he pointed out that they seemed to have originated as flood gravels, at a period when the climate was sufficiently cold for the Chalk to be frozen and impervious to a considerable depth. These gravels, however, when traced westward rapidly change their character, the Chalk disappearing, and the flints having a more weathered and rounded appearance. In short, they become more like ordinary valley gravels. The change corresponds with what might have been anticipated, for then, as now, the winter climate was doubtless considerably milder to the west, and denudation would therefore be more like the type to which we are now accustomed in Britain. Nothing like Coombe rock has yet been found in Dorset, and very little in Hants, though the area covered by it is so extensive in Sussex.

Excavations and borings undertaken last year by Mr. Reid at Hoxne have thrown a good deal of light on the question of the relation of man to the Glacial epoch. He has now proved that the Palæolithic period is certainly newer than the period of intense glaciation represented by the chalky Boulder Clay. He has also found that between the two came a mild epoch, when a temperate flora flourished in Suffolk, followed by a cold epoch when only

dwarf Arctic plants could endure. The evidence agrees closely with that obtained during the Geological Survey in Sussex and Hampshire, where also Palæolithic gravels are separated from the period of maximum glaciation, represented by the "Selsey erratics," by fluviatile deposits containing remains of animals and plants indicative of temperate climate. The whole of these recent researches tend to show that the earliest satisfactory evidence of man's appearance in this country indicates a date considerably later than has often been supposed.

North Downs.—At the close of the season Mr. Reid paid a brief visit with Mr. B. Harrison to the part of the North Downs where that gentleman had obtained the extremely rude and doubtful "implements" about which a good deal has lately been written. The pits that had been opened were, unfortunately, too much obscured by the falling in of the sides to allow of proper examination; but the evidence for the supposed extreme antiquity of the deposit seemed to rest more on the geology of the surrounding area than on the character of the sections.

An examination of the plateau shows that the dip slope which extends from the Chalk escarpment to the Thames has been greatly modified by the excavation of numerous "coombes," which fall towards the north. As these coombes, like those of the South Downs, nearly all commence close to the continuous ridge of the escarpment, without cutting through it, they appear like those of Sussex, formerly described by Mr. Reid, to have originated since the escarpment was in its present position. It is clear, also, that if the dry chalk-valleys of the South Downs were excavated by floods caused by the impervious nature of the frozen soil, at a period when the climate was colder, the same reasoning must apply to the North Downs. The gently sloping plain and slight hollow near Parsonage Farm is, in Mr. Reid's view, exactly one of those places where gravel, formed from the reconstruction of the Clay-with-flints, Eocene, and Pliocene strata, might be expected to have been deposited in late Pleistocene times. Elevation above the sea-level, or above adjoining valleys, under such Arctic conditions, would be no test of the antiquity of the gravels. These might obviously have been deposited at any level, and over rocks that are now pervious and no longer liable to floods, if the winter climate were severe, the slope gentle, and the area dominated by land somewhat higher.

Mr. Reid would, therefore, correlate these plateau gravels of the North Downs with the implement-bearing gravels of Sussex and the Thames Valley, and would suggest that the rude character of most of the implements—if implements they be—may be due to the weathered surface, the flints from which they were made having been toughened by weathering, so that they could only be battered, not flaked. It is well known to every road surveyor that flints picked off a field are much tougher than those dug directly out of the Chalk; for not only have they gone through an annealing process, but they are survivors after the weather has destroyed those that

contain flaws. The surprising point is not that implements should occur in these gravels, but that good implements should be so extremely rare.

The occurrence in the plateau gravels of fragments of Ightham stone points to their transportation across the area now occupied by a deep east and west valley. The date of that transportion is not yet known; but the discovery of much Greensand and Purbeck chert in the Bagshot sands of the Hampshire basin suggests that in the North Downs also it may date back to Eocene times. In the older Pliocene period, also, a plane of marine denudation seems to have connected the Greensand and Chalk areas. Thus, during two periods at least, Greensand chert may have been transported to the North Downs. Its final deposition in the gravels near Parsonage Farm is probably only the last of many removals to which the fragments have been subjected.

Whether any part of the existing sheet of Clay-with-flints remained undisturbed in the Glacial period is very doubtful, and this deposit certainly overlaps and contains material from both Eocene and Pliocene strata. The discovery even of undoubted Palæolithic implements at a considerable depth in Clay-with-flints would be insufficient to carry back the antiquity of man beyond the last period when the soil was frozen and the higher Downs were subject to torrential action.

Cuttings on the Manchester, Sheffield, and Lincolnshire Railway.—Advantage has been taken of the making of the new Manchester, Sheffield, and Lincolnshire Railway to obtain all the information to be derived from the sections of rock exposed in the cuttings. Mr. Woodward, in continuation of his work of the previous year, has made notes of these sections on the six-inch maps between Helmdon and Quainton road near Aylesbury. One of the most interesting points observed by him was the occurrence of thin streaks or strips of reddish-brown clay in the lower portion of the Boulder Clay, and more or less parallel to the bedding of the rubbly Oolite beneath. In places this Oolite was much broken and even nipped up. Again, further south, the Boulder Clay was seen resting on a piped surface of Great Oolite, the pipes being filled in part with reddish-brown clay, like that just mentioned. The agent which accumulated the Boulder Clay appears to have passed over an old weathered land-surface formed of Great Oolite. That formation was disturbed in places, and portions of the soil were stripped off and included with the masses of rubble and other rock in the drift.

Leighton Buzzard.—In the course of his work near Leighton Buzzard Mr. Cameron has noted several interesting sections in the Drift. The chalky Boulder Clay is found in places to lie quite evenly on the soft sands of the Lower Greensand, and the remarkable false bedding in that formation shows no sign of disturbance. Elsewhere the agent which formed the Boulder Clay has eroded great hollows in the Lower Greensand, and these hollows are filled with Boulder Clay and with alternating masses of sand which have been

torn from the Lower Greensand and rearranged with fragments of flint, &c.

Borders of Derbyshire, Leicestershire, and Staffordshire.—Little true Boulder Clay has been seen by Mr. Fox-Strangways in the ground surveyed by him last year on the borders of Derbyshire, Leicestershire, and Staffordshire, the greater part of the area appearing to be nearly free from Drift except of a local character. This fact goes to support his previous observation that the great mass of Drift which is found round Leicester ends off abruptly along a north and south line near Market Bosworth. Towards the Trent Valley, however, the Drift appears to set in again, so that a driftless district, or one nearly free from Drift, about ten miles in breadth, will not improbably be found to exist between the Trent and Soar Valleys.

North Staffordshire.—In the course of revision of the North Staffordshire coalfield Mr. De Rance has continued his observations among the erratic boulders. He has found that the fringe of large boulders extending beyond the horizontal limit of the Glacial Drift, and rising above its vertical plane of termination, is well marked between Beech and Swinnerton Old Park, south of Newcastle. More than a thousand boulders have been noted in the space of a mile on rock bare of Drift. Many hundreds of these exceed a yard in length, and consist of Buttermere granite and Lake District andesites.

Recent.

South Wales.—A few observations regarding recent geological phenomena may be enumerated. During the progress of the Survey in South Wales the sequence of the alluvial clays and peat bordering the Bristol Channel has been noted. Extensive excavations at Port Talbot for the construction of a new dock have supplied Mr. Gibson with fresh information, and have enabled him to collect a series of specimens for future examination. The coast at this locality is open to the Bristol Channel. It is formed by hillocks of blown sand, which range up to fifty feet in height, but no solid rock is visible. Beneath the blown sand of variable thickness lies a clay with *Scrobicularia* in the position of life. This clay passes here and there into fine-bedded sand, and contains two layers of peat at 2 feet and 26 feet respectively below Ordnance datum. In the lower peat antlers of deer have been found. The presence of *Foraminifera* and *Scrobicularia* throughout the clay, and of *Cardium edule* in parts of it, indicates a marine or estuarine origin for the whole of it, and the peats themselves seem to be matted masses of drifted weeds and logs of wood, and not to denote land surfaces. Lines of erosion appear here and there, but are only such as might have been due to the shifting of a river bed through its alluvial flat. The River Avan formerly entered the sea near the site of the excavation, and at one time or another has wandered through most parts of the alluvial tract. These estuarine deposits rest, at a depth of 26 feet below Ordnance datum, upon gravel which rises inland, and reaches the surface under Port Talbot.

The Port Talbot section, while resembling those of Cardiff and Newport, which also lie open to the Bristol Channel, differs from that observed in the almost land-locked estuary of the Cadoxton river at Barry, where the estuarine or marine character was confined to the upper few feet of the deposit; while the clays below, besides containing fresh-water shells, with an occasional trace of the influence of brackish water, enclosed several peat beds, two of which were submerged land-surfaces with land shells and trees in position of growth. The lowest land-surface proved a depression of the land to the extent of nearly 60 feet; and the fact that the marine part of the series rested on an eroded surface of the fresh-water strata indicated a sudden incursion of the sea that was doubtless a direct result of that depression. The detection of a fragment of a polished flint implement in the uppermost peat by Mr. Storrie served to fix the age of the bed as neolithic or later. No doubt the Port Talbot, Barry Dock, Cardiff, and Newport deposits were synchronous, and differ merely according to the configuration of the coasts on which they were formed.

In South Wales, as elsewhere in Britain, the Glacial drifts have originally been deposited in mounds and ridges, that enclose hollows which become tarns and lakes. Some of these hollows still exist as water basins, but most of them have been filled up by rain-wash and peat. One of them has been shown, by a deep railway-cutting, to contain a few feet of shell marl under the peat.

General.

Daily inquiries continue to be made at the office of the Geological Survey, 28 Jermyn Street, London, S.W., for information in regard to the practical applications of geology.

Among the Government Departments which have sought assistance of this nature during the year are the War Office, the Admiralty, the Local Government Board, the Board of Agriculture, the Office of Woods and Forests, and the Ordnance Survey.

In addition to inquiries having reference to water supply, reservoirs, drainage, soils, proposed new lines of railway, sites of houses, and sanitary matters, others have been made concerning building stones, lime and cement, clays, chert, gypsum, rock salt, dolomite, material for rockeries, &c.

The Board of Agriculture having applied for advice in the preparation of county maps of Great Britain to show the nature of the soils and subsoils in reference to their lithological characters and agricultural capabilities, some specimens of such maps on the scale of one inch to a mile, and of four miles to the inch, were prepared and sent to the Board. Assistance was also given to the Welsh Land Commission in regard to geological subjects.

RECENT AGRICULTURAL INVENTIONS.

The subjects of Applications for Patents from September 12 to December 10, 1898.

N.B.—Where the Invention is a communication from abroad, the name of the Inventor is shown in italics, between parentheses, after the name of the applicant.

Agricultural Machinery and Implements, &c.

No. of Application. Year 1898.	Name of Applicant.	Title of Invention.
19482	JACKLE, M. F.	Threshing machines.
19604	NUBAR, B. P.	Ploughing and cultivating machines.
19772	ORAM, F. P.	Machinery for tilling land.
19677	TWIST, J. W.	Safety guards for chaff-cutters.
19839	DARBY, T. A. & S.	Revolving tools of cultivators.
19924	ADAMSON, W. H.	Chaff-cutting machines.
19954	HOWARD, J. C.	„ „
20363	REDFERN, G. F. (*Peacock, Victoria*)	Rotary disc ploughs.
20738	ZIVKOVIC, M.	Sowing plough.
20861	REED, D.	Potato diggers.
20898	POWELL, J. E., & ors.	„ „
21055	WESLEY, J.	Guard for chaff-cutters.
21104	SETTLE, C. T.	Reversible disc harrow.
21170	RANSOME, J. E.	Weed extractor.
21350	EDWARDS, S.	Chaff-cutting machines.
21487	BOUSFIELD, E. T.	Cultivators.
21648	SÉE, P.	Walls of silos.
21814	BAUMANN, F.	Ploughs.
21834	REDFERN, G. F. (*Peacock, Victoria*)	Rotary disc ploughs.
21857	COCKERELL, J., & anr.	Potato plough.
22170	MEHRTENS, F. C.	Corn-ear conveyers for harvesting.
22489	MCKNIGHT, E.	Machine for turning, &c., hay.
22554	ROSEMANN, H.	Cutters for hoeing machines.
22570	BURGESS, W. J.	Steam cultivator.
23019	JOHNSTON, D, & anr.	Potato-sorting machine.
23432	BIRTWISLE, W.	Mowing and reaping machines.
23587	MAX REITZES & anr.	Scythes.
23715	KÖVÉR, E.	Ploughs.
23869	HOUGHTON, T. H.	Appliances for cutting turf.
24080	LAKE, H. H. (*Steward, U.S.A.*)	Grain harvesters.
24184	„ „ „	Mowing machines.
24208	PETTER, P. W.	Mowing and reaping machines.

No. of Application. Year 1898.	Name of Applicant.	Title of Invention.
24586	WARBURTON, J. S.	Knife cutting-point for cultivators.
25031	MARTIN, W. E.	Cultivators.
25050	WALLACE, R. & W.	Machinery for distributing artificial manures.
25498	MACPHAIL, J.	Harvesters.
25587	VUTZ, G.	Reeds of self-binding harvesters.
25918	DAMENE, H.	Ploughs.
26035	WALKER, J.	Chaff-cutting machines.
26047	BABCOCK, G. W., & ors.	Riding attachments for agricultural implements.
26084	DYBALL, A.	Chaff-cutting machines.
26108	WITTHOLD, J. F.	Plough with manure-distributing device.
26118	ARTER, A. C.	Mowing-machine frames.

Stable Utensils and Fittings—Horse-shoes, &c.

Year 1898.		
19363	DOBSON, G., & anr.	Nosebags.
19427	PORTSMOUTH, W.	Horse-shoes.
19441	KAUN, O.	Reinholders.
19661	ENOCH, E. L.	Horse-collar protector.
19919	ORPWOOD, W. L.	Saddle-bars.
20123	WARTNABY, G.	Horse-shoe plugs.
20170	BOTT, J. E.	Horse-shoes.
20325	ORPWOOD, W. L.	Stirrup buckle.
20331	WILSON, E.	Horse-collars.
20369	MERRETT, J.	" "
20459	LEMON, J. G.	Horse-shoes.
20483	COLLISON, S.	" "
20737	HOOPER, H. W.	" "
20772	VERITY, H.	Saddles, breeches strappings.
20939	MARTIN, P. A.	Riding saddles.
21119	SIMPSON, H.	Hameless collars.
21234	PICARD, P.	Curry-combs.
21520	PARKER, F. H.	Straddles of draught harness.
21656	BIRKBECK, H. (*Curtis, U.S.A.*)	Horse-collars.
21930	FRIEDERERG, E S.	Feeding-bag.
22009	RUSHTON, S. & A.	Horse-shoes.
22045	HICKTON, J. H. W.	Suspender for nosebags.
22186	ALLPRESS, W. A.	Traces.
22245	THOMPSON, W. P. (*Koenig, Germany*)	Protective foot covering for curing hoof diseases.
22287	BURTON, M. A.	Safety stirrup bars.
22372	MANNING, T.	Collars.
22690	DILLON, W. S.	Harness straps.
22851	ROBINSON, C., & anr.	Horse-shoes.
22912	MCCONNELL	Nailless horse-shoes.
23065	LEMON, J. G.	Horse-shoes.
23118	BROMLEY, J. & G.	" "

No. of Application. Year 1898.	Name of Applicant.	Title of Invention.
23845	Low, C.	Revolving brush for grooming.
23994	Weibezahl, H. G.	Attaching feedbags to horses.
24244	Craddock, R., & son	Covering bits with india-rubber.
24322	Bromley, G., & ors.	Horse-shoes.
24512	Behrens, N.	Bits.
24635	Fitter, J. H.	Horse-shoes.
24699	Selby, T. B.	Saddles
24805	Footit, F. B.	Holders for saddles.
24870	Kemp, J.	Adjustable horse-shoe.
24900	Buerubier, V. P.	Harness.
25112	Hunt, J. G., & anr.	Horse-shoes.
25196	Wakfer, W. H.	" "
25253	Riley, J., & ors.	" "
25444	Adcock, T. E.	Harness saddles.
25445	Wood, J., & ors.	Attaching, &c., panels to riding saddles.
25470 } 25471 }	Brigg, T. H.	Connecting horses to vehicles.
25639	Parker, C. D.	Saddle bar.
25792	Prescott, S. J.	Shackles or hooks for harness.
25915	Jackson, H. & R.	Hook for the shafts of riding whips for mounting with.

Dairy Utensils, &c.

Year 1898.		
19530	Morris, R.	Milk-cans.
19731	Hartford, S.	Taking delivery of milk from milkmen.
19747	Coker, W. P.	Churns.
19812	Drake, W.	Appliance for cutting cheese.
20800	Newton (*Kroeber, S., Germany*)	Milking apparatus.
20896	Waller, P. A.	Churns.
21472	Bradford, T.	Securing lids of churns.
21738	Lawrence, W. H., & anr.	Milking apparatus.
21863	Lister, C. A.	Revolving rack for storage of sterilised milk, &c.
22055	Fliegel, J.	Milk-cans.
22119	Milton, F.	" "
23631	Plaut, H. C.	Removing dirt from milk.
23637	Julien, M.	Treating butter for conservation and restoration
24022	Johnson, D.	Churns for butter making.
24132	Sandbach, W.	Milk heater and cooler.
24410	Haworth, F. G. & W.	Milk-churns.
25126	Jones, S. C.	Churns.
25512	Parsons, A. M.	Milk-cans.
25517	Fearncombe, H. & Co., Ltd.	Fastening lids of railway milk-churns.

Poultry and Game, &c., Appliances.

No. of Application. Year 1898.	Name of Applicant.	Title of Invention.
19898	WILLCOCKS, J., & anr.	Incubators.
20030	GOLBY (*Zichy, G. A., Austria-Hungary*)	Protecting pheasants against poachers.
20761	WILSON, J.	Draught-proof ventilator for poultry houses, &c
21681	WHALLEY, J. F.	Incubators.
21455	SMITH, J. L.	Automatic poultry feed-supply fountain.
22222	PAYNTER, F. G	Feeding coops.
23783	HARROWELL, A.	Game and poultry coop.
23923	HATHWAY, J.	Chicken portable houses.
23941	CALWAY, W.	Foster-mothers.
24618	NEWSOM, C.	Incubators.
25898	NICHOLS, E. A.	Apparatus for rearing chickens, &c.

Miscellaneous.

Year 1898.		
21534	BECKSTROOM, G.	Foodstuff for cattle.
25500	SIVEWRIGHT, G. W.	Cattle-stall and like fittings.

Numbers of Specifications relating to the above subjects published since September 12, 1898.[1]

(Price 8d. each copy.)

Specifications of 1897.

21282, 21305, 23991, 24279, 24927, 25173, 25276, 25591, 26158, 26562, 26814, 26904, 27068, 27079, 27386, 27956, 28888, 28931, 29171, 29714, 29892, 30781, 30793, 30849.

Specifications of 1898.

1083, 1242, 1302, 1322, 1450, 2075, 2315, 2562, 2902, 3291, 3923, 7760, 8879, 9300, 9994, 10380, 11355, 12737, 12869, 13710, 13834, 13901, 15554, 16386, 16703, 17304, 17713, 18112, 18347, 18500, 18593, 19441, 20459, 20738, 20896, 20992, 21071.

[1] Copies may be obtained at the Patent Office (Sale and Store Branch), Quality Court, Chancery Lane, London, E.C.

STATISTICS AFFECTING BRITISH AGRICULTURAL INTERESTS.

TABLE I.—*Acreage under each kind of* **Crop, Bare Fallow,** *and* **Grass,** *as returned upon June 4, in the years* 1898 *and* 1897, *in Great Britain, with Totals for the United Kingdom.*

—		GREAT BRITAIN 1898	GREAT BRITAIN 1897	UNITED KINGDOM, including ISLE OF MAN and CHANNEL ISLANDS 1898	UNITED KINGDOM, including ISLE OF MAN and CHANNEL ISLANDS 1897
		acres	acres	acres	acres
TOTAL AREA OF LAND AND WATER (*a*)		56,771,523	56,771,523	77,671,114	77,671,114
TOTAL ACREAGE under ALL KINDS of CROPS, BARE FALLOW, and GRASS (*b*)		32,477,031	32,520,076	47,792,474	47,868,553
CORN CROPS.	Wheat	2,102,220	1,889,161	2,158,479	1,938,956
	Barley or Bere	1,903,652	2,035,790	2,068,746	2,213,529
	Oats	2,917,760	3,036,056	4,097,791	4,226,231
	Rye	68,795	76,486	81,285	89,621
	Beans	232,007	228,912	233,870	230,429
	Peas	175,901	190,656	176,585	191,326
	TOTAL	7,400,335	7,457,061	8,816,756	8,890,092
GREEN CROPS.	Potatoes	524,591	504,914	1,201,417	1,194,194
	Turnips and Swedes	1,772,466	1,833,145	2,087,469	2,150,289
	Mangel	352,271	354,558	408 818	409,501
	Cabbage, Kohl Rabi, & Rape	165,724	166,061	214,970	213,043
	Vetches or Tares	193,612	199,424	197,420	203,955
	Other Green Crops	124,857	130,776	151,368	156,586
	TOTAL	3,133,521	3,189,508	4,261,492	4,327,568
CLOVER, SAINFOIN, and GRASSES under Rotation.	For Hay	2,381,551	2,265,965	3,047,585	2,977,607
	Not for Hay	2,529,638	2,567,843	3,163,266	3,215,191
	TOTAL	4,911,189	4,833,808	6,210,851	6,152,798
PERMANENT PASTURE, or GRASS *not broken up in Rotation.* (*b*)	For Hay	4,536,425	4,510,333	6,065,409	6,055,699
	Not for Hay	12,023,077	12,002,535	21,913,400	21,869,011
	TOTAL	16,559,502	16,512,868	27,978,809	27,924,710
FLAX		902	1,419	35,391	46,995
HOPS		49,735	50,863	49,735	50,863
SMALL FRUIT		69,753	69,792	(*c*) 70,238	(*c*) 70,245
BARE FALLOW or Uncropped Arable Land		352,094	381,757	369,202	405,282

(*a*) Not including foreshore and tidal water.
(*b*) Not including mountain and heath land.
(*c*) Not separately shown for Ireland.

TABLE II.—*Number of* **Horses, Cattle, Sheep,** *and* **Pigs** *returned upon June* 4, *in the years* 1898 *and* 1897, *with Totals for the United Kingdom.*

—			Great Britain 1898	Great Britain 1897	United Kingdom, including Isle of Man and Channel Islands 1898	United Kingdom, including Isle of Man and Channel Islands 1897
			No	No	No	No
Horses.	Used solely for Agriculture (a)		1,075,308	1,068 250	(b) —	(b) —
	Unbroken Horses.	1 Year & above	318,887	326,185	(b) —	(b) —
		Under 1 Year .	122,965	131,989	(b) —	(b) —
	Total		1,517,160	1,526,424	2,040,330	2,069,852
Cattle.	Cows and Heifers in-Milk or in-Calf . . .		2,587,190	2,532,379	4,035,501	3,984,167
	Other Cattle.	2 Years and above	1,381,595	1,323,230	2,414 205	2,340,906
		1 Year & under 2	1,345,844	1,360,741	2,337,184	2,334,691
		Under 1 Year .	1,307,735	1,284,147	2,362,322	2,344,270
	Total		6,622,364	6,500,497	11,149,212	11,004,034
Sheep.	Ewes kept for breeding .		10,137,932	10,006,697	18,897,390	18,729,041
	Other Sheep.	1 Year and above .	6,203,858	6,219,001		
		Under 1 Year .	10,401,404	10,114,742	12,204,969	11,838,020
	Total		26,743,194	26,340,410	31,102,359	30,567,061
Pigs.	Sows kept for breeding .		362,200	334,244	(b) —	(b) —
	Other Pigs		2,089,395	2,008,058	(b) —	(b) —
	Total		2,451,595	2,342,302	3,719,219	3,682,819

(*a*) Including mares kept for breeding.
(*b*) Not separately shown for Ireland.

TABLE III.—*Preliminary Statement showing the Estimated Total Production of* **Hops** *in the Years* 1898 *and* 1897, *with the Acreage and Estimated Average Yield per Statute Acre, in each County of England in which Hops were grown.*

Counties	Estimated total produce 1898	Estimated total produce 1897	Acreage 1898	Acreage 1897	Estimated average yield per acre 1898	Estimated average yield per acre 1897
	cwt.	cwt.	acres	acres	cwt.	cwt.
Gloucester . .	210	360	40	40	5 25	9 00
Hants . . .	11,256	22,414	2,263	2,306	4 97	9 72
Hereford . .	45,346	56,898	6,651	6,542	6 82	8·70
Kent . . .	229,842	245,093	30,941	31,601	7 43	7 74
Monmouth . .	9	10	2	2	4·50	5·00
Salop . . .	819	1,020	126	129	6 50	7·91
Suffolk . . .	18	5	3	2	6 00	2·50
Surrey . . .	6,142	11,257	1,313	1,416	4 68	7 95
Sussex . . .	34,299	43,092	4,829	5,174	7·10	8 33
Worcester . .	28,657	30,937	3,567	3,591	8 03	8 62
Total . .	356,598	411,086	49,735	50,863	7·17	8 08

TABLE IV.—*Preliminary Statement showing the Estimated Total Produce and Yield per Acre of* **Wheat, Barley,** *and* **Oats** *in Great Britain in the Year* 1898, *with Comparative Statements for the Year* 1897, *and for the Average of the Ten Years* 1888–97.

WHEAT.

—	Estimated Total Produce		Acreage		Estimated Yield per Acre		Average of the Ten Years 1888–97
	1898	1897	1898	1897	1898	1897	
	Bushels	Bushels	Acres	Acres	Bushels	Bushels	Bushels
England .	69,074,347	51,724,955	1,987,385	1,755,562	34·70	28·97	29·19
Wales . .	1,582,086	1,332,192	58,960	53,810	26·83	24·76	23·49
Scotland .	2,372,383	1,893,388	55,861	49,789	42·47	37·83	35·90
Great Britain	73,028,956	54,940,535	2,102,206	1,899,161	34·74	29·08	29·19

BARLEY.

—	Estimated Total Produce		Acreage		Estimated Yield per Acre		Average of the Ten Years 1888–97
	1898	1897	1898	1897	1898	1897	
	Bushels	Bushels	Acres	Acres	Bushels	Bushels	Bushels
England .	55,377,522	55,158,713	1,562,761	1,698,323	35·44	32·48	32·03
Wales . .	3,377,413	3,116,438	102,921	104,371	32·82	29·86	29·22
Scotland .	9,296,983	8,538,915	237,084	233,096	39·07	36·63	35·77
Great Britain	68,051,915	66,814,066	1,903,666	2,035,790	35·75	32·82	32·97

OATS.

—	Estimated Total Produce		Acreage		Estimated Yield per Acre		Average of the Ten Years 1888–97
	1898	1897	1898	1897	1898	1897	
	Bushels	Bushels	Acres	Acres	Bushels	Bushels	Bushel
England .	75,282,761	73,638,993	1,731,157	1,829,072	43·49	40·26	40·50
Wales . .	8,389,938	7,765,962	230,670	238,510	36·37	32·56	32·42
Scotland .	35,248,218	35,442,224	955,933	968,471	36·87	36·60	36·50
Great Britain	118,920,917	116,847,179	2,917,760	3,036,056	40·76	38·49	38·51

Royal Agricultural Society of England.

(*Established May* 9, 1838, *as the* ENGLISH AGRICULTURAL SOCIETY, *and Incorporated by Royal Charter on March* 26, 1840.)

Patron.

(*Letter from Secretary of State, dated March* 6, 1840.)

HER MOST GRACIOUS MAJESTY THE QUEEN.

President for 1897—1898.

EARL SPENCER, K.G.

Year when elected on Council	
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1879	H.R.H. THE PRINCE OF WALES, K.G., *Marlborough House, Pall Mall.*
1895	H.R.H. THE DUKE OF YORK, K.G., *York House, St. James's Palace.*
1838–40 / 1855	ACLAND, Rt. Hon. Sir THOMAS DYKE, Bart., *Killerton, Exeter, Devonshire.*
1858	BRIDPORT, Gen. Viscount, G.C.B., *Forde Abbey, Chard, Somerset.*
1871	EGERTON OF TATTON, Earl, *Tatton Park, Knutsford, Cheshire.*
1881	GILBEY, Sir WALTER, Bart., *Elsenham Hall, Essex.*
1863	KINGSCOTE, Col. Sir NIGEL, K.C.B., *Kingscote, Wotton-under-Edge, Gloucestershire.*
1848	LAWES, Sir JOHN BENNET, Bart., *Rothamsted, St. Albans, Herts.*
1854–59 / 1862	MACDONALD, Sir ARCHIBALD K., Bart., *Woolmer Lodge, Liphook, Hants.*
1852–57 / 1866	RICHMOND AND GORDON, Duke of, K.G., *Goodwood, Chichester, Sussex.*
1869	RIDLEY, Rt. Hon. Sir M. W., Bart., M.P., *Blagdon, Cramlington, Northumberland.*
1892	WESTMINSTER, Duke of, K.G., *Eaton Hall, Chester.*
	Vice-Presidents.
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1874	CHANDOS-POLE-GELL, H., *Hopton Hall, Wirksworth, Derbyshire.*
1872–74 / 1884	CHAPLIN, Rt. Hon. HENRY, M.P., *Stafford House, S.W.*
1882	EMLYN, Viscount, *Golden Grove, Carmarthen, S. Wales.*
1876	FEVERSHAM, Earl of, *Duncombe Park, Helmsley, Yorkshire.*
1872	LATHOM, Earl of, G.C.B., *Lathom Hall, Ormskirk, Lancashire.*
1865	LOPES, Rt. Hon. Sir MASSEY, Bart., *Maristow, Roborough, Devon.*
1880	MORETON, Lord, *Sarsden House, Chipping Norton, Oxon.*
1867	RAVENSWORTH, Earl of, *Ravensworth Castle, Gateshead, Durham.*
1874	SPENCER, Earl, K.G., *Althorp, Northampton.*
1881	THOROLD, Sir JOHN H., Bart., *Syston Park, Grantham, Lincolnshire.*
1870	WHITEHEAD, CHARLES, *Barming House, Maidstone, Kent.*

Other Members of Council.

Year when elected on Council	
1862–66, 1877	*ARKWRIGHT, J. HUNGERFORD, *Hampton Court, Leominster, Herefordshire.*
1880	ASHWORTH, ALFRED, *Tabley Grange, Knutsford, Cheshire.*
1895	*BEDFORD, Duke of, *Woburn Abbey, Bedfordshire.*
1895	*BLAKE, GEORGE, *The Red House, Amesbury, Wiltshire.*
1871	BOWEN-JONES, J., *Ensdon House, Montford Bridge, Salop.*
1890	*BROUGHAM AND VAUX, Lord, *Brougham Hall (Penrith), Westmorland.*
1893	CORNWALLIS, F. S. W., *Linton Park, Maidstone, Kent.*
1885	COVENTRY, Earl of, *Croome Court, Severn Stoke, Worcestershire.*
1887	CRUTCHLEY, PERCY E., *Sunninghill Lodge, Ascot, Berkshire.*
1891	*CURTIS-HAYWARD, Lieut.-Col. J. F., *Quedgeley, Gloucester.*
1888	DARBY, ALFRED E. W., *Little Ness, Shrewsbury.*
1895	DERBY, Earl of, K.G., *Knowsley, Prescot, Lancashire.*
1893	*DEVONSHIRE, Duke of, K.G., *Chatsworth, Chesterfield, Derbyshire.*
1891	DUGDALE, J. MARSHALL, *Llwyn, Llanfyllin* (viâ *Oswestry*), *Mont.*
1879	*FOSTER, S. P., *Killhow, Wigton, Cumberland.*
1875	*FRANKISH, WILLIAM, *Limber, near Brocklesby, Lincolnshire.*
1879	GORRINGE, HUGH, *Ashcroft, Kingston-by-Sea, Brighton, Sussex.*
1896	*GRANBY, Marquis of, *Belvoir Castle (Grantham), Leicestershire.*
1879	*GRENVILLE, R. NEVILLE, *Butleigh Court, Glastonbury, Somerset.*
1888	*HORNSBY, JAMES, *Laxton Park (Stamford), Northamptonshire.*
1883–90, 1894	JERSEY, Earl of, G.C.M.G., *Middleton Park, Bicester, Oxon.*
1897	*LEVETT, Captain W. S. B., *Milford Hall, Stafford.*
1886	MAINWARING, C. S., *Galltfaenan, Trefnant, R.S.O., North Wales.*
1897	*MARSHALL, HENRY D., *Carr House, Gainsborough, Lincolnshire.*
1874	MARTIN, JOSEPH, *Highfield House, Littleport, Isle of Ely, Cambs.*
1884	MILLER, T. HORROCKS, *Singleton Park, Poulton-le-Fylde, Lancashire.*
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1897	REYNARD, FREDERICK, *Sunderlandwick, Driffield, Yorkshire.*
1897	*ROGERS, C. COLTMAN, *Stanage Park, Brampton Bryan, Herefordshire.*
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1894	*RYLAND, HOWARD P., *Moxhull Park, Erdington, Birmingham.*
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* Members of Council who retire by rotation, but who may be re-elected.

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*** The PRESIDENT is a Member *ex officio* of all Committees, and the TRUSTEES and VICE-PRESIDENTS are Members *ex officiis* of all Standing Committees except the Committee of Selection.

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MARTIN, JOSEPH.
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LEVETT, Capt. W. S. B.
MAINWARING, C. S.
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DERBY, Earl of, K.G.
PARKER, Hon. C. T.
THOROLD, Sir J. H., Bart.
ARKWRIGHT, J. H.
ASHWORTH, A.
CURTIS-HAYWARD, Lt.-Col.
DARBY, ALFRED.
DUGDALE, J. MARSHALL.
GRENVILLE, R. N.
LEVETT, Capt. W. S. B.
MAINWARING, C. S.
STANYFORTH, E. W.
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GEOGRAPHICAL DISTRIBUTION OF MEMBERS OF THE COUNCIL AND OF GOVERNORS AND MEMBERS OF THE SOCIETY.

Districts	Counties	Number of Governors and Members	Number of Members of Council	Names of Members of Council
A.	Bedfordshire . .	140	1	Duke of Bedford.
	Buckinghamshire	141	2	G. H. Sanday; Jos. P. Terry.
	Cambridgeshire .	211	1	Joseph Martin.
	Essex	245	1	Sir Walter Gilbey, T.
	Hertfordshire .	183	1	Sir J. B. Lawes, T.
	Huntingdonshire	80	—	
	London	532	1	H.R.H. the Duke of York, K.G., T.
	Middlesex . . .	86		
	Norfolk	298	2	H.R.H. the Prince of Wales, K.G., T.; Garrett Taylor.
	Oxfordshire . .	151	3	Earl of Jersey; Lord Moreton, V.P.; M. J. Sutton.
	Suffolk	232	2	J. E. Ransome; A. J. Smith.
		——2,302	— 14	
B.	Cumberland . .	154	1	S. P. Foster.
	Durham	214	2	Earl of Ravensworth, V.P.; W. T. Scarth.
	Northumberland	271	2	Sir M. White Ridley, T.; Sir Jacob Wilson.
	Westmorland . .	83	2	Lord Brougham and Vaux; C W. Wilson.
		—— 722	— 7	
C.	Derbyshire . . .	238	2	Duke of Devonshire K.G.; H. Chandos-Pole-Gell, V.P.
	Leicestershire .	233	2	Marquis of Granby; J. Hornsby
	Lincolnshire . .	321	4	Sir J. H. Thorold, V.P.; Rt. Hon. H. Chaplin, V.P.; W. Frankish; H. D. Marshall.
	Northamptonshire	192	2	Earl Spencer, K.G., P.; A. Pell.
	Nottinghamshire	247	1	H. Smith.
	Rutland	42	—	
		——1,273	— 11	

DISTRIBUTION OF MEMBERS OF THE SOCIETY—*continued.*

Districts	Counties	Number of Governors and Members		Number of Members of Council		Names of Members of Council
D.	Berkshire	203		2		H.R.H. Prince Christian, K.G., V.P.; P. E. Crutchley.
	Cornwall	124		1		J. C. Williams.
	Devonshire	152		2		Sir T. D. Acland, T.; Sir M. Lopes, V.P.
	Dorsetshire	77		—		
	Hampshire	234		1		Sir A. K. Macdonald, T.
	Kent	506		2		C. Whitehead, V.P.; F. S. W. Cornwallis.
	Somersetshire	128		2		Visct. Bridport, T.; R. Neville Grenville.
	Surrey	232		1		D. Pidgeon.
	Sussex	339		3		Duke of Richmond and Gordon, K.G., T.; H. Gorringe; R. A. Warren.
	Wiltshire	146		1		G. Blake.
			2,141		15	
E.	Yorkshire		876		5	Earl of Feversham, V.P.; A. E. Pease; F. Reynard; S. Rowlandson; E. W. Stanyforth.
F.	Gloucestershire	279		2		Col. Sir Nigel Kingscote, T.; Lt.-Col. J. F. Curtis-Hayward.
	Herefordshire	118		2		J. H. Arkwright; C. C. Rogers.
	Monmouthshire	18		1		R. Stratton.
	Shropshire	339		2		J. Bowen-Jones; A. Darby.
	Staffordshire	310		1		Capt. W. S. B. Levett.
	Warwickshire	297		2		P. A. Muntz; H. P. Ryland.
	Worcestershire	221		2		Earl of Coventry; E. V. V. Wheeler.
	South Wales	195		1		Viscount Emlyn, V.P.
			1,837		13	
G.	Cheshire	515		4		Duke of Westminster, K.G., T.; Earl Egerton, T.; Hon. Cecil T. Parker; A. Ashworth.
	Lancashire	554		3		Earl of Lathom, V.P.; Earl of Derby, K.G; T. H. Miller.
	North Wales	237		2		J. M. Dugdale; C. S. Mainwaring.
			1,306		9	
Scotland		241				
Ireland		172				
Channel Islands		13				
Isle of Man		17				
Foreign Countries		180				
Honorary Members		25				
			648			
Grand Totals			11,105		72	

GOVERNORS OF THE SOCIETY.

	Date of election as Member	Date of election as Governor
T H.R.H. THE PRINCE OF WALES, K.G....Marlborough House, S.W., and Sandringham, Norfolk	—	Feb. 3, 1864
†H.R.H. THE DUKE OF SAXE-COBURG AND GOTHA (DUKE OF EDINBURGH), K.G....Clarence House, St. James's, S.W.	—	Aug. 6, 1884
T †H.R.H. THE DUKE OF YORK, K.G....York House, St. James's Palace, S.W., and Sandringham, Norfolk	—	April 6, 1892
†H.R.H. THE DUKE OF CAMBRIDGE, K.G....Gloucester House, Piccadilly, W.	—	Aug. 6, 1862
VP H.R.H. PRINCE CHRISTIAN OF SCHLESWIG-HOLSTEIN, K.G....Cumberland Lodge, Windsor	—	Aug. 4, 1875
T *ACLAND, Rt. Hon. Sir T. Dyke, Bart...Killerton, Exeter	May 29, 1838	Mar. 3, 1875
†ALLCROFT, Herbert John...Stokesay Court, Onibury, Salop	—	Dec. 12, 1888
†AMHERST OF HACKNEY, Lord...Didlington Hall, Brandon	Feb. 2, 1859	May 7, 1890
ANCASTER, Earl of...Normanton Park, Stamford	Mar. 3, 1869	May 5, 1875
ARCHER-HOUBLON, George B....Hallingbury Place, Bishop's Stortford	—	Mar. 6, 1889
‖†ARKWRIGHT, J. Hungerford...Hampton Court, Leominster	—	June 5, 1861
ASHBURTON, Lord...The Grange, Alresford, Hants	—	May 7, 1890
†ASHWORTH, Charles E....The Heath, Knutsford	July 5, 1865	July 29, 1891
BARNARD, Lord...Raby Castle, Darlington	—	July 27, 1892
*BATTEN, John...Aldon, Yeovil, Somersetshire	July 16, 1839	Mar. 5, 1890
‖†BEDFORD, Duke of...Woburn Abbey, Bedfordshire	—	May 3, 1893
†BEEVER, W. F. Holt...Yewden Lodge, Henley-on-Thames	April 2, 1879	June 6, 1894
†BELPER, Lord...Kingston, Derby	July 6, 1881	Mar. 6, 1895
†BENN, Thomas G....Reigny House, Newton Reigny, Penrith	Mar. 13, 1878	Aug. 2, 1882
†BLYTH, Sir James, Bart...Blythwood, Stansted, Essex	Nov. 3, 1875	July 27, 1892
BRASSEY, Henry Leonard C....Preston Hall, Aylesford, Kent	—	Feb. 3, 1892
T BRIDPORT, Gen. Viscount, G.C.B....Forde Abbey, Chard	Jan. 19, 1842	April 2, 1862
†BROOKS, Sir William Cunliffe, Bart....Barlow Hall, Chorlton-cum-Hardy, Manchester	—	Aug. 7, 1872
†BROWNE, Alexander H....Callaby Castle, Whittingham R.S.O., Northumberland	—	Mar. 6, 1872
BURGHCLERE, Lord...48 Charles Street, Berkeley Square, W.	—	Dec. 7, 1892
BURTON, Lord...Rangemore, Burton-on-Trent	Nov. 7, 1888	June 25, 1890
BUTE, Marquis of, K.T....Mount Stuart, Rothesay, N.B.	—	April 4, 1894
CADOGAN, Earl, K.G...Culford Hall, Bury St. Edmunds	—	Dec. 11, 1889
†CAIRD, James A...Cassencary, Creetown, N.B.	May 7, 1873	July 31, 1895
CALTHORPE, Lord...Elvetham, Winchfield	Nov. 7, 1683	May 2, 1894
†CATHCART, Earl...Thornton-le-Street, Thirsk	Feb. 6, 1856	April 3, 1867
†CAVENDISH, Victor C.W., M.P....Devonshire House, Piccadilly, W.	—	Mar. 2, 1892
CAWDOR, Earl of...Stackpole Court, Pembrokeshire	Nov. 17, 1841	Mar. 3, 1875
†CAWSTON, George...Warren House, Kingston Hill, Surrey	—	June 6, 1894
VP†CHANDOS-POLE-GELL, H....Hopton Hall, Wirksworth, Derbyshire	Nov. 6, 1861	June 23, 1891
VP CHAPLIN, Rt. Hon. Henry, M.P....Stafford House, S.W.	—	Nov. 2, 1870
CHELSEA, Viscount, M.P....31A Green Street, Park Lane, W.	—	Feb. 6, 1895
†CLARENDON, Earl of...The Grove, Watford	June 5, 1872	May 2, 1894
†CLINTON, Lord...Heanton Satchville, Beaford, N. Devon	April 3, 1867	April 2, 1890
CLITHEROW, Colonel Edward J. S....Hotham Hall, Brough, Yorkshire	—	Feb 6, 1889
†COLMAN, J. J....Carrow House, Norwich	June 1, 1870	Feb. 6, 1889
†CORBETT, John...Impney, Droitwich	July 2, 1873	Feb. 4, 1891
‖CORNWALLIS, Fiennes S. W....Linton Park, Maidstone	—	July 2, 1884
COTES, Charles Cecil...29 Cadogan Ter., Cadogan Sq., S.W.	—	Dec. 6, 1876

* Elected a Foundation Life Governor, March 5, 1890. † Life Governor.
T Trustee, VP Vice-President. ‖ Member of Council.

	Date of election as Member	Date of election as Governor
‖†COVENTRY, Earl of...Croome Court, Severn Stoke, Worc.	April 1, 1863	April 4, 1894
†COWPER, Earl, K.G....Panshanger, Hertford	—	April 7, 1875
CRAVEN, Thomas...Woodheyes Park, Ashton-on-Mersey	May 6, 1891	Dec. 6, 1893
CREWE, Earl of...Crewe Hall, Crewe, Cheshire	Feb. 6, 1884	Mar. 7, 1894
CROOKSHANK, Prof. E. M....Saint Hill, East Grinstead	—	Nov. 6 1889
DARTMOUTH, Earl of...Patshull Hall, Wolverhampton	—	Dec. 9, 1891
‖†DERBY, Earl of, K.G., G.C.B....Knowsley, Prescot	June 3, 1874	May 2, 1894
DERWENT, Lord...Hackness Hall, Scarborough	—	April 7, 1869
†DE TRAFFORD, Sir H. F., Bart....18 Arlington Street, W.	Aug. 1, 1883	June 1, 1892
‖†DEVONSHIRE, Duke of, K.G....Chatsworth, Chesterfield	—	June 2, 1880
†DEWHURST, G. Littleton...Beechwood, Lymm, Cheshire	Dec. 9, 1891	May 2, 1894
†DICKSON-POYNDER, Sir J., Bart., M.P....Hartham Park, Corsham, Wilts	Nov. 2, 1887	April 2, 1890
DIGBY, Lord...Minterne House, Cerne Abbas, Dorset	—	July 25, 1894
†DULEEP-SINGH, Prince Frederick...Hockwold Hall, Brandon	—	July 25, 1894
DUNCOMBE, W. H. O...Waresley Park, Sandy, Beds	April 1, 1885	May 6, 1896
†DUNMORE, Earl of...Carlton Club, Pall Mall, S.W.	—	Feb. 3, 1869
†DURHAM, Earl of...Lambton Castle, Durham	—	July 14, 1880
T EGERTON OF TATTON, Earl...Tatton Park, Knutsford	Mar. 6, 1872	Nov. 7, 1883
†ELLESMERE, Earl of...Worsley Hall, Manchester	—	July 7, 1869
VP†EMLYN, Viscount...Golden Grove, Carmarthenshire	Mar. 3, 1863	Mar. 2, 1892
ESSEX, Earl of...Cassiobury Park, Watford	Nov. 7, 1888	Nov. 2, 1892
VP FEVERSHAM, Earl of...Duncombe Park, Helmsley, Yorks	Mar. 5, 1862	Mar. 3, 1875
†FIELDEN, Thomas...Grimston Park, Tadcaster	Aug. 6, 1879	Mar. 6, 1895
FIFE, Duke of, K.T....15 Portman Square, W.	—	Nov. 7, 1888
FITZWILLIAM, Earl, K.G....Wentworth Woodhouse, Rotherham	—	June 5, 1872
*FLETCHER, John Philip...Darby Lodge, Sunbury-on-Thames	Feb. 19, 1840	Mar. 5, 1890
†FORTESCUE, Earl...Castle Hill South Molton	—	Nov. 6, 1861
FREAKE, Sir Thomas G., Bart....Warfleet, Dartmouth	—	July 30, 1890
†FREEMAN-MITFORD, A. B., C.B....Batsford Park, Moreton-in-the-Marsh, Gloucestershire	—	Nov. 3, 1886
†FYTCHE, J. Lewis...The Terrace, Freshwater, Isle of Wight	April 5, 1854	June 4, 1879
T GILBEY, Sir Walter, Bart...Elsenham Hall, Essex	Nov. 2, 1870	June 5, 1889
GLENESK, Lord...Heath House, Hampstead Heath, N.W.	—	Dec. 12, 1888
GOOCH, Sir Alfred S., Bart...Benacre Hall, Wangford, Suffolk	—	July 13, 1882
GORDON, H. Panmure...Loudwater House, Rickmansworth	—	Mar. 1, 1893
GRAFTON, Duke of, K.G....Wakefield Lodge, Stony Stratford	—	June 3, 1884
GRAHAM, Sir Reginald H., Bart....Norton Conyers, Ripon	Nov. 1, 1882	June 25, 1895
†GRANT, Sir G. Macpherson, Bt....Ballindalloch Castle, N.B.	April 1, 1863	April 2, 1890
†GREENALL, Sir Gilbert, Bart....Walton Hall, Warrington	Feb. 3, 1892	May 2, 1894
GRIFFITHS, John James...Highbury Grange, Highbury, N.	—	May 1, 1889
GROVES, James G....Oldfield Hall, Altrincham	—	May 1, 1895
GWYNNE, John...Kenton Grange, The Hyde, N.W.	—	Mar. 5, 1879
HAREWOOD, Earl of...Goldsboro' Hall, Knaresborough	June 6, 1883	Nov. 2, 1892
HAY, Arthur W. H....Oakley Park, Hoxne, Suffolk	—	Nov. 4, 1896
†HENDERSON, Alexander...Buscot Park, Faringdon, Berks.	Nov. 5, 1890	July 28, 1897
HENRY, Mitchell...Kylemore Castle, co. Galway	Nov. 7, 1877	Dec. 10, 1890
HERTFORD, Marquis of...Ragley Park, Alcester	Aug. 2, 1882	May 7, 1884
†HEYWOOD, Sir A. Percival, Bt...Duffield Bank, Derby	April 7, 1875	Feb 2, 1898
HODGSON, John, Nocton Hall, Nocton, Lincolnshire	—	Mar. 2, 1898
†HOLFORD, Capt. George L., C.I.E....Westonbirt, Tetbury, Glos.	—	April 6, 1892
†HOPETOUN, Earl of...Hopetoun House, South Queensferry, N.B.	Nov. 7, 1888	July 31, 1895
‖†HORNSBY, James...Laxton Park, Stamford	June 6, 1878	May 29, 1895
†HOTHFIELD, Lord...Hothfield Place, Ashford, Kent	—	May 7, 1879
*†HULSE, Col. Sir Edward, Bt...Breamore Ho., Fordingbridge	—	June 13, 1838

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T Trustee. VP Vice-President. ‖ Member of Council.

	Date of election as Member	Date of election as Governor
†HUTH, Louis...Possingworth, Hawkhurst	Dec. 12, 1888	Feb. 6, 1895
†IRWIN, Colonel T. A....Lynehow, Carlisle	May 5, 1880	June 25, 1895
†IVEAGH, Lord, K.P....5 Grosvenor Place, S.W.	—	June 6, 1894
‖†JERSEY, Earl of, G.C M.G....Middleton Park, Bicester	June 30, 1875	April 4, 1894
JOICEY, E....Blenkinsopp Hall, Haltwhistle, Northumberland	—	Dec. 12, 1888
†JONES, Walter J. H....Blakemere, Hartford, Cheshire	April 11, 1888	May 2, 1894
*KEMBLE, Thomas...Runwell Hall, Wickford, Essex	July 10, 1839	Mar. 5, 1890
T†KINGSCOTE, Col. Sir Nigel, K.C.B....Kingscote, Wotton-under-Edge, Gloucestershire	April 6, 1854	July 1, 1874
KOHLAPUR, H.H. The Maharajah of...Kohlapur, India	—	Feb. 6, 1889
†KYNNERSLEY, Thomas F....Leighton Hall, Ironbridge, Salop	Nov. 7, 1883	Nov. 4, 1891
†LANSDOWNE, Marquis of, K G...Bowood, Calne, Wilts.	Feb. 3, 1875	Feb. 5, 1896
VP†LATHOM, Earl of, G.C.B....Lathom House, Ormskirk	April 7, 1869	Nov. 6, 1872
T†LAWES, Sir J. B, Bart...Rothamsted, St. Albans	April 29, 1846	Dec. 11, 1878
†LECONFIELD, Lord...Petworth House, Sussex	—	June 5, 1872
†LEICESTER, Earl of, K.G...Holkham Hall, Norfolk	—	Nov. 15, 1843
†LEIGH, Lord...Stoneleigh Abbey, Kenilworth.	—	Dec. 1, 1858
†LLANGATTOCK, Lord...The Hendre, Monmouth	Mar. 1, 1871	May 2, 1894
†LONDESBOROUGH, Earl of...Londesborough Pk., Market Weighton	Nov. 5, 1862	April 2, 1890
†LONDONDERRY, Marquis of, K.G....Seaham Hall, Seaham Harbour, co. Durham	—	June 3, 1885
†LONG, Rt. Hon. W. H., M.P....Rood Ashton, Trowbridge	April 8, 1880	Dec. 11, 1895
†LONSDALE, Earl of...Lowther Castle, Penrith	—	July 4, 1883
VP†LOPES, Rt. Hon. Sir Massey, Bt...Maristow, Roborough, Devon	Mar. 15, 1848	May 7, 1884
LUCAS, Sir Thomas, Bart...12A Kensington Palace Gardens, W.	—	Dec. 12, 1888
McCALMONT, Harry, M.P....Cheveley Park, Newmarket	—	Feb. 7, 1894
T†MACDONALD, Sir A. K., Bart...Woolmer Lodge, Liphook	July 31, 1849	Nov. 1, 1871
†MANVERS, Earl...Thoresby Park, Ollerton, Newark	—	July 2, 1873
†MAPLE, John...Bedford Lodge, Haverstock Hill, N.W.	Nov. 2, 1864	Mar. 5, 1890
MARSHALL, William...Mere House, Weaverham, Northwich	April 6, 1892	April 7, 1897
†MASON, James...Eynsham Hall, Witney, Oxon.	May 1, 1867	May 2, 1894
MIDDLETON, Lord...Birdsall House, York	—	Mar. 3, 1875
*MONCK, J. Bligh...Coley Park, Reading	May 23, 1839	Mar. 5, 1890
†MOORSOM-MITCHINSON-MAUDE, C. R....Harewood, Leeds	Dec. 2, 1857	July 26, 1893
VP†MORETON, Lord...Sarsden House, Chipping Norton, Oxon.	—	Mar. 3, 1875
†MOREWOOD, C. R. Palmer...Alfreton Park, Derbyshire	April 7, 1875	Feb. 7, 1894
†MORRELL, Lt.-Col. G. H., M.P....Headington Hill Hall, Oxford.	June 6, 1878	July 25, 1894
†MOUNT-EDGCUMBE, Earl of...Mount-Edgcumbe, Plymouth	Nov. 6, 1861	Mar. 5, 1890
MUNCASTER, Lord...Muncaster Castle, Ravenglass, Cumberland	—	June 23, 1891
†MUNTZ, George F...Umberslade Park, Birmingham	Dec. 4, 1867	June 30, 1875
NEELD, Sir Algernon W., Bart...Grittleton, Chippenham	Nov. 7, 1888	Dec. 9, 1891
NEWTON, Lord...Lyme Park, Disley, Stockport	—	Aug. 4, 1858
NORFOLK, Duke of, K.G....Arundel Castle, Sussex	—	July 29, 1891
†NORTHBROOK, Earl of...Stratton, Micheldever Station, Hants	—	June 2, 1880
PARK, Philip...The Oaks, Penwortham, Preston	—	Nov. 4, 1896
†PEEL, Edmund. Brynypys, Ellesmere	Feb. 3, 1858	Mar. 5, 1890
*PINNEY, Col. William...30 Berkeley Square, W.	Mar. 13, 1839	Mar. 5, 1890
†PLATT, Col. Henry...Gorddinog, Llanfairfechan	Mar. 5, 1862	Feb. 3, 1897
PLATT, James E....Bruntwood, Cheadle, Cheshire	June 30, 1886	May 1, 1895
†PORTLAND, Duke of...3 Grosvenor Square, W.	—	June 2, 1880
†PORTMAN, Viscount...Bryanston, Blandford	Aug. 6, 1862	Mar. 5, 1890
PORTSMOUTH, Earl of...Hurstbourne Park, Whitchurch, Hants	—	Dec. 9, 1891
†POWIS, Earl of...Powis Castle, Welshpool	April 6, 1887	June 23, 1891
†QUILTER, Sir W. Cuthbert, Bart., M.P...Bawdsey Manor, Woodbridge	Mar. 3, 1886	April 7, 1897

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T Trustee. VP Vice-President. ‖ Member of Council.

	Date of election as Member	Date of election as Governor
†Ramsden, Lt.-Col. W. J. F....Bogerthorpe Manor, Pontefract	May 2, 1883	June 25, 1895
VP Ravensworth, Earl of...Ravensworth Castle, Gateshead	Feb. 5, 1868	July 1, 1885
Reiss, James E....36 Cadogan Square, S.W.	Feb. 7, 1883	May 2, 1894
T*†Richmond & Gordon, Duke of, K.G...Goodwood, Chichester	June 20, 1838	Dec. 2, 1868
T†Ridley, Rt. Hon. Sir Matthew W., Bart., M.P....Blagdon, Cramlington, Northumberland	April 7, 1869	May 5, 1886
Ripon, Marquis of, K.G....Studley Royal, Ripon	—	July 3, 1861
Rolle, Hon. Mark...Bicton, Budleigh Salterton, Devon	—	Nov. 7, 1894
†Rosebery, Earl of, K.G...38 Berkeley Square, W.	—	June 6, 1894
Rothschild, Leopold de...Ascott, Wing, Leighton Buzzard	—	Mar. 1, 1893
Rothschild, Lord...148 Piccadilly, W.	Nov. 7, 1888	June 4, 1890
Rutland, Duke of, K.G....Belvoir Castle, Leicestershire	Dec. 12, 1888	Dec. 9, 1891
†Salisbury, Marquis of, K.G...Hatfield House, Herts	—	Feb. 6, 1889
Salomons, Leopold...Norbury Park, Dorking	—	May 6, 1896
†Schröder, Baron J. H. W....The Dell, Egham, Surrey	Nov. 3, 1869	April 2, 1890
*§Simonds, Prof. James Beart...St. John's Villa, Ryde, I.W.	July 25, 1838	Mar. 5, 1890
*Simonds, W. Barrow...Abbotts Barton, Winchester	June 19, 1839	Mar. 5, 1890
Smith, Hon. W. F. D., M.P...3 Grosvenor Place, S.W.	—	Dec. 9, 1891
†Smyth, Sir J. H. Greville, Bart...Ashton Court, Bristol	—	July 3, 1878
*Sparks, William...Crewkerne, Somerset	June 6, 1838	Mar. 5, 1890
P Spencer, Earl, K.G...Althorp Park, Northampton	Dec. 5, 1860	Mar. 3, 1875
‖†Stanyforth, E. W....Kirk Hammerton Hall, York	Feb. 6, 1884	July 31, 1895
†Starkie, Col. Le Gendre N....Huntroyde, Burnley	Nov. 4, 1874	June 6, 1894
Strafford, Earl of...Wrotham Park, Barnet	Dec. 8, 1875	Mar. 7, 1894
*Stratton, J. Locke...Turweston House, Brackley	May 13, 1839	Mar. 5, 1890
Stubs, Peter...Blaisdon Hall, Newnham, Glos.	July 27, 1892	Dec. 12, 1894
Sutherland, Duke of...Trentham, Stoke-on-Trent	Mar. 1, 1882	Dec. 7, 1892
†Sutton, John Manners...Kelham, Newark	—	May 8, 1844
‖†Sutton, Martin J...Wargrave Manor, Berkshire	May 1, 1878	Feb. 1, 1882
†Swinburne, Sir John, Bart....Capheaton, Newcastle-on-Tyne	May 1, 1867	May 7, 1890
†Tanqueray, John S...Balmain, 5 Albany Road, St. Leonards	Feb. 16, 1848	May 8, 1849
†Thompson, Henry Yates...26A Bryanston Square, W.	—	Nov. 7, 1894
VP†Thorold, Sir John H., Bart....Syston Park, Grantham	Aug. 5, 1868	May 1, 1889
Tredegar, Lord...Tredegar Park, Newport, Mon.	—	May 3, 1876
†Tremayne, John...Heligan, St. Austell, Cornwall	July 8, 1863	Feb. 6, 1895
Tress, G. Russell...Whitelee, St. Boswell's, N.B.	May 29, 1895	Feb. 6, 1897
Turbervill, Col. J. P....Laleston House, Bridgend	Mar. 5, 1884	July 27, 1892
†Tweedmouth, Lord...Guisachan, Beauly, N.B.	—	July 31, 1889
Walter, Arthur F....Bearwood, Wokingham	—	Mar. 6, 1895
†Wantage, Lord, V.C...Lockinge, Wantage	June 3, 1863	May 1, 1872
‖†Warren, Reginald A....Preston Place, Worthing	June 3, 1857	June 6, 1894
Watson, William C....Colworth, Bedford	—	Dec. 11, 1895
West, Thomas B. C....The Depperhaugh, Hoxne, Suffolk	Feb. 1, 1893	Nov. 4, 1896
T Westminster, Duke of, K.G...Eaton Hall, Chester	July 3, 1860	June 5, 1872
White, R. Holmes...Boulge Hall, Woodbridge	—	Nov. 3, 1897
VP†Whitehead, Charles...Barming House, Maidstone	April 1, 1857	Feb. 6, 1889
†Williams, Henry...Moor Park, Harrogate	Aug. 1, 1883	Mar. 6, 1895
Willoughby de Broke, Lord...Kineton House, Warwick	—	Dec. 10, 1890
‖†Wilson, Sir Jacob...Chillingham Barns, Belford, Northumbd.	Dec. 5, 1860	Dec. 7, 1892
†Windsor, Lord...Hewel Grange, Bromsgrove	—	Nov. 6, 1878
†Wright, William...Wollaton, Nottingham	May 1, 1867	Dec. 12, 1894
†Yerburgh, Robert A., M.P...Billinge, Scarr, Blackburn	—	Nov. 7, 1888
†Zetland, Marquis of...Aske Hall, Richmond, Yorks.	Feb. 4, 1874	May 2, 1894

* Elected a Foundation Life Governor, March 5, 1890. † Life Governor. § Honorary Member.
T Trustee. VP Vice-President. ‖ Member of Council.

HONORARY MEMBERS OF THE SOCIETY.

(*"British Subjects or Foreigners who have rendered exceptional services to Agriculture or Allied Sciences," and who have been elected under Bye-law 8 as Honorary Members, without payment of subscription.*)

	Date of election as Honorary Member
ANDERSON, Sir William, K.C.B., D.C.L., M.Inst.C.E., F.R.S.…Lesney House, Erith (Ordinary Member, Aug. 2, 1871)	Nov. 6, 1889
BROWN, Professor Sir George T., C.B.…Bryn Hyfryd, Harrow (Ordinary Member, Dec. 3, 1862)	May 1, 1878
CARTUYVELS-VAN-DER-LINDEN, Jules, M.A.…215 Rue de la Loi, Brussels	Dec. 11, 1895
CHAUVEAU, Prof. Auguste, M.D., LL.D.…10 Avenue Jules Janin, Passy, Paris	Dec. 6, 1893
DANNFELT, Carl Juhlin B.…Consul-Genl. of Sweden and Norway, 24 Great Winchester St., E.C.	Feb. 1, 1871
FLEISCHMANN, Prof. Wm.…Director of the Agricultural Institute of the Royal University of Königsberg	Dec. 12, 1894
FLEMING, George, LL.D., C.B.…Higher Leigh, Combe Martin, North Devon	Mar. 13, 1878
FOSTER, Prof. Michael, M.A., Sec. R.S.…Nine Wells, Great Shelford, Cambridge	Feb. 3, 1897
GILBERT, Sir J. Henry, Ph.D., D.Sc., F.R.S.…Harpenden, St. Albans	July 4, 1883
HOHENBRUCK, Baron Arthur von…I Niebelungengasse 8, Vienna	Nov. 5, 1890
LIVEING, Prof. G. D., M.A., F.R.S.…Cambridge	Mar. 7, 1894
MAERCKER, Prof. Dr. M.…Versuchs-Station, Halle, Germany	Nov. 2, 1892
NOBBE, Dr. J. C. F.…Director of the Experimental Station, Tharand, Saxony	May 6, 1896
NOCARD, Prof. Edmond…Ecole Vétérinaire, Alfort, France	Dec. 11, 1895
PASSY, Louis…45 Rue de Clichy, Paris	June 23, 1891
PLAYFAIR, Rt. Hon. Lord, G.C.B.…68 Onslow Gardens, S.W.	July 6, 1842
PROSKOWETZ, Emanuel Ritter von, Senr.…Kwassitz, Moravia	Nov. 5, 1890
SANDERSON, Dr. J. Burdon, F.R.S.…Oxford	May 1, 1878
SCHERBATOFF, Prince Alexander…President of the Imperial Agricultural Society of Moscow, Russia	Nov. 3, 1897
SCHLIEFFEN, Count…Schlieffenburg, bei Lalendorf, Mecklenburg, Germany	Dec. 12, 1883
SICKESZ VAN DE CLOESE, Dr. C. J.…Heerengracht 17, The Hague, Holland	Dec. 9, 1891
SIMONDS, Prof. J. Beart…St. John's Villa, Ryde, Isle of Wight (Ordinary Member, July 25, 1838)	April 3, 1849
THIEL, Dr. H.…Privy Councillor, and Director of the Department of Agriculture, 17 Lutherstrasse, Berlin	Aug. 1, 1883
TISSERAND, Eugène…Ancien Directeur de l'Agriculture, 17 Rue du Cirque, Paris	Aug. 1, 1883
VILMORIN, Henry L. de…17 Rue de Bellechasse, Paris (Ordinary Member Aug. 2, 1879)	June 4, 1890

SUMMARY OF MEMBERS ON THE REGISTER,

MARCH 31, 1898.

12	**Foundation Life Governors** (Members elected before the granting of the Charter on March 26, 1840).
80	**Governors** paying an annual subscription of 5*l.*
109	**Life Governors** who have compounded for their annual subscriptions.
7,197	**Members** paying an annual subscription of 1*l.*
3,574	**Life Members** who have compounded for their annual subscriptions.
108	**Life Members by Examination.**
25	**Honorary Members.**
11,105	**Total number of Governors and Members at March 31, 1898.**

Dr. BALANCE SHEET,

Corresponding figures for 1896 £		£	s.	d.	£	s.	d.	£	s.	d.
26,055	To RESERVE FUND at December 31, 1896				24,721	2	0			
517	Interest on Consols				417	0	0			
261	„ „ Harewood House Debenture Stock				376	13	3			
825	Life Compositions received during 1897				880	0	0			
27,658					26,394	15	3			
2,937	Less: Contribution to Revenue (at 15*s.*) from 3,843 Life Members on Books on January 1, 1897 + 57 Compounders during 1897				2,925	0	0			
24,721								23,469	15	3
17,396	To CAPITAL as per last Account, represented by Books, Furniture, Machinery, Country Meeting Plant, Cash, &c.				21,153	19	11			
—161	Add: Balance to Credit of Ordinary Income and Expenditure Account, as per Statement (*A*)	636	18	0						
3,600	Add: Balance to Credit of Manchester Show Account, as per Statement (*B*)	4,074	0	1						
1,131					4,710	18	1			
21,966					25,864	18	0			
	Less: Depreciation written off—									
306	Fixtures	283	10	6						
171	Furniture	164	15	1						
85	Machinery	76	7	4						
250	Country Meeting Plant	237	15	4						
812					762	8	3			
21,154								25,102	9	9
45,875								£48,572	5	0

[*Note.*—The Society's Invested Assets, as stated in this Balance Sheet, are those held by it for the benefit of its general Funds. In addition, it holds in its corporate name 8,126*l.* 8*s.* 2*d.* Consols, representing a Legacy of 9,000*l.* received in 1896 under the will of the late Mr. E. H. Hills. The income arising therefrom is, under the will, to be applied in the investigation of the value and uses of the rarer forms of ash in the cultivation of crops; and the Trust will be administered under the Charitable Trusts Acts.]

ERNEST CLARKE, *Secretary.*

WELTON, JONES & CO., *Accountants.*

DECEMBER 31, 1897. *Cr.*

Corresponding figures for 1896 £		£ s. d.	£ s. d.	£ s. d.
15,484	By 16,000*l.* CONSOLS at cost (Average cost 96*l.* 15*s.* 6¼*d.*) . . .			15,484 10 0
	Value on December 31, 1897, *at* 112¾=18,040*l.*			
	[Of this 16,000*l.* Stock, 105*l.* is held against Special Prizes.]			
15,547	By 15,600*l.* HAREWOOD HOUSE DEBENTURE STOCK at net cost to Society			15,647 1 6
	By FIXTURES at Harewood House—	£ s. d.		
4,081	Value at December 31, 1896	3,780 7 11		
301	Less: Depreciation at 7½ per cent.	283 10 6		
3,780			3,496 17 5	
	By FURNITURE—			
3,537	Value at December 31, 1896	3,427 1 3		
171	Less: Depreciation at 7½ and 5 per cent.	164 15 1		
3,366			3,262 6 2	
61				
3,427				
1,500	By PICTURES (600*l.*) and BOOKS (1,000*l.*)		1,600 0 0	
	By MACHINERY—			
849	Value at December 31, 1896	763 13 3		
85	Less: Depreciation at 10 per cent.	76 7 4		
764			687 5 11	
	By COUNTRY MEETING PLANT—			
4,994	Value at December 31, 1896	4,750 7 6		
250	Less: Depreciation at 5 per cent.	237 15 4		
4,744		4,512 12 2		
6	Added during 1897	112 9 7		
4,750			4,625 1 9	
				13,571 11 3
—	By Cost of Erection of BUILDINGS for "POT EXPERIMENTS" at Woburn			1,068 10 11
1,104	By Sundry DEBTORS			342 19 1
—	By Expenditure on Account of 1898			1,208 13 2
	By CASH and SECURITIES IN HAND, December 31, 1897—			
168	Secretary and Consulting Chemist		398 9 3	
2,582	Cash on Deposit and Interest thereon		2,557 18 9	
1,839	Consols Certificates for 1,900*l.*, taken at average cost to Society (98*l.* 15*s.* 6¼*d.* per cent.)		1,838 15 8	
4,589			4,795 3 8	
3,524	Less: Sundry CREDITORS	3,196 10 7		
101	Less: Subscriptions received in 1897, but belonging to 1898, and carried forward	110 0 0		
3,446			3,606 10 7	
				1,188 13 1
5,071	[*Memorandum.*—The above Assets are exclusive of the value of the stock of Journals, Pamphlets, and Diagrams; and also of 347*l.*, the amount recoverable in respect of arrears of Subscriptions to December 31, 1897.]			
45,875				£48,572 5 0

Examined, audited, and found correct, this 14th day of March, 1898.

C. G. ROBERTS }
JONAS M. WEBB } *Auditors on behalf of the Society.*

Income.

Corresponding figures for 1896 £		£ s. d.	£ s. d.
	ANNUAL SUBSCRIPTIONS—		
405	*Governors*. Subscriptions for 1897 . . .	414 0 0	
111	*Members* Received in 1896, but belonging to 1897	101 0 0	
6,767	Subscriptions for 1897	6,921 12 0	
67	Subscriptions for previous years	67 0 0	
96	Interest allowed by Bankers, &c.	129 7 1	
7,446			7,632 19 1
	LIFE COMPOSITIONS—		
2,937	Contribution to Revenue (See Balance Sheet)— 3,900 Life Members at 15s.		2,925 0 0
−161			
10,544			£10,557 19 1

ERNEST CLARKE, *Secretary*.

WELTON, JONES & CO., *Accountants*.

Expenditure.

Corresponding figures for 1896 £		£ s. d.	£ s. d.
	GENERAL ADMINISTRATION:—		
2,862	Proportion of Salaries of Secretarial Staff (including Temporary Assistance)	2,272 18 0	
190	Pensions to Officials	190 0 0	
40	Professional Charges	46 14 6	
11	Grant to Mansion House Association on Railway and Canal Traffic	10 10 0	
1,999	House Rent, Taxes, Insurance, and House Expenses	1,846 13 6	
25	Binding and Purchase of Books	56 17 9	
385	Printing and Stationery	482 9 3	
180	Postage and Telegrams	144 15 11	
22	Carriage of Parcels, and Cabs	14 10 1	
44	Advertising and Miscellaneous Office Expenses	130 9 10	
88			5,195 18 10
5,846			
	JOURNAL OF SOCIETY AND OTHER PUBLICATIONS:—		
1,275	Printers' Bills for the four numbers of 1897	1,283 6 6	
134	Wood Engravings and Illustrations	153 14 4	
899	Editor and Literary Contributions	768 2 0	
657	Postage, Packing, and Delivery	657 18 1	
39	Miscellaneous Journal Printing	31 5 7	
25	Miscellaneous Journal Expenses	50 12 11	
155	Cost of Printing Pamphlets	33 6 11	
91	Text Book, "Elements of Agriculture"	245 3 9	
3,275		3,213 10 1	
129	Less: Received from Sales of Journal . . . £145 4 1		
409	Advertisements in Journal . . . 400 5 3		
52	Sales of Pamphlets and Diagrams . . . 55 3 0		
112	Sales of Text Book on Agriculture . . . 79 7 4	679 19 8	
702			2,533 10 5
2,573	**LABORATORY:—**		
1,250	Salaries, Wages, &c.	1,250 0 0	
52	Printing, and Sundry Expenses	47 8 2	
1,302		1,297 8 2	
843	Less: Fees received from Members for Analyses	547 17 6	
			749 10 8
454	**OTHER SCIENTIFIC DEPARTMENTS:—**		
200	Consulting Botanist's Salary	237 10 0	
203	Zoologist's Salary	200 0 0	
500	Grant to Royal Veterinary College	500 0 0	
2	Medals for Proficiency in Cattle Pathology	2 7 6	
—	Printing	23 1 3	
154	Expenses of Grass Experiments	60 4 1	
			1,023 2 10
1,059			
	EXAMINATION IN THE SCIENCE AND PRACTICE OF AGRICULTURE:—		
24	Medals	24 4 0	
75	Five Life Memberships at 15*l.* each	75 0 0	
93	Fees to Examiners	128 2 0	
8	Advertising Examination	7 3 4	
12	Printing, &c.	15 15 2	
	Hire of Hall for Examination	15 0 0	
200			265 4 6
412	**EXAMINATION IN THE SCIENCE AND PRACTICE OF DAIRYING:—**		
26	Hire of Premises for Examination	26 5 0	
40	Hire of Utensils	20 13 8	
00	Fees to Examiners	56 5 6	
43	Hotel and Travelling Expenses	36 9 4	
7	Printing	1 15 7	
18	Advertising Examination	12 4 9	
			153 13 10
200			
	Total Expenditure		9,921 1 1
	Balance carried to Balance Sheet		636 18 0
10,544			£10,557 19 1

Examined, audited, and found correct, this 14th day of March, 1898.

C. G. ROBERTS
JONAS M. WEBB } *Auditors on behalf of the Society.*

Receipts.

Corresponding figures for 1896		£ s. d.	£ s. d.
	SUBSCRIPTION:—		
£2,000	From Manchester Local Committee		2,000 0 0
	FEES FOR ENTRY OF IMPLEMENTS:—		
5,135	Implement Exhibitors' Payments for Shedding	6,341 6 4	
216	Non-members' Fees for Entry of Implements	242 0 0	
71	Fees for Entry of "New Implements"	75 0 0	
5,422			6,658 6 4
	FEES FOR ENTRY OF LIVE STOCK:—		
464	By Members:—1,968 Entries @ 5s.	492 0 0	
87	126 Post Entries @ 10s.	63 0 0	
	66 Late " @ 1l.	66 0 0	
13	65 Substituted Entries @ 5s.	16 5 0	
213	By Non-members:—430 Entries @ 10s.	215 0 0	
73	56 Post Entries @ 1l.	56 0 0	
	12 Late " @ 2l.	24 0 0	
3	9 Substituted Entries @ 10s.	4 10 0	
769			936 15 0
391	Fees for Horse Boxes and Stalls		611 0 0
	FEES FOR ENTRY OF POULTRY:—		
27	By Members:—183 Entries @ 2s. 6d.	22 17 6	
4	13 Post Entries @ 5s.	3 5 0	
149	By Non-members:—599 Entries @ 5s.	149 15 0	
11	13 Post Entries @ 10s.	6 10 0	
4	50 Entries of Table Poultry	4 2 0	
191			186 9 6
	OTHER ENTRY FEES:—		
85	Fees for Entry of Produce	104 10 0	
14	Fees for Entries in Horse-shoeing Competition	21 0 0	
8	Deposits in Competitions forfeited	24 10 0	
111			150 0 0
	CATALOGUE:—		
124	Extra Lines for particulars of Implement Exhibits	77 9 0	
9	Woodcuts for New Implements	4 13 9	
250	Advertisements in Catalogue	298 0 0	
383			380 2 9
47	Sales of Implement Section of Catalogue (including bound copies)	36 12 3	
620	Sales of Combined Catalogue	940 6 10	
24	" " " (Bound) @ 2s. 6d.	16 10 0	
—	[illegible]	95 16 9	
	Catalogues sold after Show, &c.	1 7 2	
[illegible]		1,120 13 0	
57	Less Commission on Sales in Showyard	78 4 0	
675			1,042 9 0
	MISCELLANEOUS RECEIPTS—		
129	Fines for non-exhibition of Live Stock, &c.		203 15 0
£11,933	Carried forward		£12,168 17 7

Expenditure.

Corresponding figures for 1896.		£ s. d.	£ s. d.
	Cost of Erection of Showyard:—		
£5,482	Timber	8,164 0 3	
160	Ironmongery	288 17 10	
47	Paints, Oil, Glass, Lead, &c.	112 13 10	
60	Bricks, Lime, Cement, and Coal	127 14 4	
22	Expenses for Gas	96 7 9	
1,657	Canvas, Roofing Cloth, Felt, Baize, &c.	2,034 7 10	
606	Railway Charges, 325*l.* 2*s.* 2*d.*; Horse Hire, 255*l.* 19*s.*	581 1 2	
40	Insurance	41 2 11	
93	Stationery, Postage, and Telegrams	106 5 9	
19	Hire of Furniture, &c.	22 8 0	
—	Bicycles, 20*l.*; Tree Guards, 15*l.*; Hire of Carts, 16*l.*	51 0 0	
2,683	Wages	4,072 19 5	
668	Surveyor and Consulting Surveyor: Salaries and Expenses	716 12 3	
	Extra Expenses necessary in consequence of damage done by storm	458 12 2	
11,539		16,874 3 5	
	Less:—		
3,305	Sale of Materials . . . £4,750 4 2		
1,974	Work for Exhibitors and Purveyors . . . 2,762 16 0		
5,279		7,513 0 2	
6,260			9,361 3 3
	Expenses of Secretary's Department:—		
36	Expenses of Inspection Committee	5 0 0	
6	Secretary's Journeys to Manchester and Expenses	16 3 3	
195	Extra Clerical Assistance	494 5 4	
—	Proportion of Salaries of Ordinary Staff debited to Show Account	666 5 0	
237			1,181 13 7
	Printing:—		
460	Printing of Prize Sheets, Certificates, Admission Orders, Parchment Numbers, Circulars to Exhibitors, Prize Cards, Members' Tickets, and Miscellaneous	503 10 10	
8	Secretary's Local Printing	14 18 9	
50	Programmes for Members	56 7 6	
11	Plans of Showyard	11 0 6	
744	Printing of Combined Catalogues	891 10 11	
62	Binding of Catalogues	39 19 0	
8	Carriage of Catalogues to Showyard	43 2 2	
50	Printing Awards	102 9 6	
1,394			1,667 19 2
	Advertising, Bill Posting and Placarding:—		
74	Advertising Closing of Entries, &c., in Newspapers	83 5 9	
550	Advertising Show	1,741 11 8	
624			1,824 17 5
	Postage, Carriage, &c.:—		
124	General Postage, &c., 119*l.* 14*s.* 2*d.*; Postage of Tickets to Members, 38*l.* 7*s.* 9*d.*; Carriage, 13*l.* 1*s.* 4*d.*		171 3 3
4,682	**Amount of Prizes Awarded** (for details see page xviii)		4,869 4 0
	Cost of Forage for Live Stock:—		
674	Hay, 314*l.* 3*s.* 2*d.*; Straw, 450*l.* 13*s.* 1*d.*; Green Food, 233*l.* 8*s.* 6*d.*; Miscellaneous Expenses, 1*l.* 12*s.* 3*d.*; Forage for Stewards' Horses, 3*l.* 12*s.* 10*d.*		1,003 9 10
£13,996	Carried forward		£20,079 10 6

Receipts (*contd.*)

Corresponding figures for 1896.		£ s. d.	£ s. d.
£10 033	Brought forward		12,168 17 7
50	Amounts received from Refreshment Contractors		439 16 9
37	Premium for Cloak Room		36 15 0
20	**ADMISSIONS TO SHOWYARD:—**		
450	Wednesday, June 23, @ 5*s.*	1,105 12 0	
2,103	Thursday, June 24, @ 2*s.* 6*d.*	2,803 19 4	
2,700	Friday, June 25, @ 2*s.* 6*d.*	2,654 4 2	
3 983	Saturday, June 26, @ 1*s.*	3,587 1 9	
1,223	Monday, June 28, @ 1*s.*	3,663 15 2	
—	Tuesday, June 29, @ 1*s.*	1,120 6 7	
74	Day Tickets	131 10 0	
312	Season Tickets	363 4 0	
10,931			15,459 18 0
	ENTRANCES TO HORSE RING:—		
16	Wednesday, June 23	71 0 0	
233	Thursday, June 24	317 16 0	
103	Friday, June 25	253 3 6	
118	Saturday, June 26	199 1 0	
27	Monday, June 28	354 8 0	
—	Tuesday, June 29	86 9 0	
557			1,281 17 6
	DAIRY:—		
26	Receipts at Stand at Dairy	29 13 0	
97	Sales of Produce at Dairy	129 3 0	
10	Receipts at Stand at Poultry Shed	7 14 0	
133			166 9 0

PRIZES AWARDED:—

Corresponding figures for 1896.			£ s. d.
3 469	Horses, 3,205*l.*; Cattle, 1,951*l.*		5,156 0 0
1,511	Sheep, 1,240*l.* 10*s.*; Goats, 48*l.*; Pigs, 332*l.*		1,620 10 0
227	Poultry		245 10 0
138	Cheese, 202*l.*; Butter, 57*l.*		259 0 0
40	Cider and Perry		40 0 0
45	Butter-making, 76*l.*; Horse-shoeing, 32*l.*		108 0 0
52	Implements		16 0 0
3	Silver Medals for New Implements and for Champion Butter-maker		4 14 0
40	Contribution to Bee Department		40 0 0
5,7[illegible]			7,519 14 0
	Less:—		
1,0[illegible]	Prizes offered by Local Committee	£2,537 0	
76	" " Various Societies	93 10	
1,081			2,630 10 0
4,682			£4,889 4 0
£21,741			£29,553 8 10

ERNEST CLARKE, *Secretary.*
WELTON, JONES & CO., *Accountants.*

Corresponding figures for 1896.	**Expenditure** (*contd.*)	£ s. d.	£ s. d.
£13,996	Brought forward		20,079 10 6
	JUDGES' FEES AND EXPENSES:—		
45	Judges of Miscellaneous Implements	54 1 9	
63	Judges of Self-Moving Vehicles, 37*l.* 2*s.*; Fruit Baskets, 8*l.* 16*s.*	45 18 0	
709	Judges of Horses, 187*l.* 5*s.* 7*d.*; Cattle, 162*l.* 18*s.* 7*d.*; Sheep, 257*l.* 4*s.* 9*d.*; Pigs, 40*l.* 2*s.* 9*d.*; Goats, 13*l.* 19*s.*; Poultry, 37*l.* 13*s.* 5*d.*; Butter and Butter-making, 42*l.* 7*s.*; Ditto for Lodgings, 15*l.*; Cheese, 29*l.* 9*s.* 8*d.*; Cider and Perry, 8*l.* 2*s.* 4*d.*; Horse-shoeing, 32*l.* 15*s.*; Ditto for Lodgings, 12*l.*	838 18 1	
817			958 17 10
23	Badges for Judges and other Officials	35 14 3	
33	Rosettes	32 11 9	
			68 6 0
	EXPENSES OF ADMINISTRATION:—		
200	*Stewards*:—Housekeeping Expenses, 223*l.* 1*s.* 6*d.*; Personal and Railway Expenses, 75*l.* 11*s.* 11*d.*	298 13 5	
142	*Assistant Stewards*:—Honoraria, 133*l.* 5*s.*; Railway Expenses, 23*l.* 13*s.* 2*d.*; Lodgings, 45*l.*	201 18 2	
140	*Secretary and Official Staff*:—Houses, 15*l.* 15*s.*; Secretary's Expenses, 2*l.* 8*s.*; Maintenance of Clerks, 68*l.* 2*s.* 6*d.*; Travelling Expenses, 23*l.* 13*s.* 6*d.*	109 14 0	
93	*Finance Office*:—Superintendent of Turnstiles, 19*l.* 14*s.*; Money Takers, 86*l.* 12*s.* 2*d.*; Bank Clerks, 27*l.* 12*s.*	133 18 2	
48	*Awards Office*:—Superintendent, 15*l.*; Clerks, 34*l.* 10*s.* 8*d.*; Award Boys, 6*l.* 17*s.* 6*d.*	56 8 2	
624			800 11 11
	General Management:—		
90	Foreman and Assistant Foremen	214 17 11	
368	Yardmen, Grooms, and Foddermen	750 7 6	
37	Door and Gate Keepers	91 13 10	
176	Carriage Hire, 91*l.* 3*s.*; Horse Hire, 160*l.* 14*s.* 3*d.*	251 17 3	
670			1,308 16 6
108	*Veterinary Department*:—Veterinary Inspectors, 115*l.* 7*s.*; Ditto for Lodgings, 12*l.*; Stabling for Sick Horses, 2*l.* 10*s.*	129 17 0	
264	*Engineering Department*:—Consulting Engineer and Assistants, 165*l.* 0*s.* 4*d.*; Expenses, 1*l.* 3*s.* 6*d.*; Carriage, 7*l.* 4*s.* 1*d.*; Repairs and Maintenance of Machinery, 20*l.* 2*s.* 6*d.*; Wages to Workmen, 38*l.* 2*s.* 1*d.*; Fittings to Dairy, 10*l.*	242 1 6	
628	*Police, &c.*:—Metropolitan Police, 840*l.* 19*s.* 4*d.*; Commissionaires, 45*l.* 10*s.* 2*d.*	886 9 6	
999			1,258 8 0
298	*Dairy*:—Milk, 126*l.* 11*s.* 2*d.*; Ice, 13*l.* 9*s.* 5*d.*; Dairy Staff, 100*l.* 6*s.*; Salt, 2*l.* 16*s.* 7*d.*; Utensils, 37*l.* 7*s.* 5*d.*; Gas 2*l.* 4*s.* 2*d.*	282 14 9	
17	Expenses of Analysing Milk of Dairy Cows	23 1 6	
315			305 16 3
79	*Poultry*:—Penning, Attendants and Food, 21*l.* 13*s.* 6*d.*; Poultry Demonstrations, 28*l.* 16*s.* 10*d.*; Purchase of Dead Poultry, 13*l.* 16*s.* 6*d.*; Carriage of Poultry to and from Showyard, 12*l.* 9*s.* 6*d.*; Refrigerating Cases, 8*l.*	84 16 4	
61	*Horse-shoeing*:—Hire of Forges, 12*l.* 10*s.*; Horses for Competition, 21*l.* 10*s.*; Coal, 10*l.* 1*s.* 1*d.*	44 1 1	
140			128 17 5
	GENERAL SHOWYARD EXPENSES:—		
110	Hire of Furniture, Canvas, &c., 72*l.* 4*s.*; Hire of Chairs, 88*l.* 8*s.*; Tan, 20*l.* 6*s.* 10*d.*; Telegraph Extension, 16*l.* 11*s.* 4*d.*; Newspapers, 1*l.* 1*s.*; Telephone, 10*l.*; Ironmongery, 63*l.* 16*s.*	222 7 2	
105	Bands	120 5 0	
13	St. John Ambulance Association	46 8 0	
81	Royal and Official Luncheons	55 14 9	
10	Gratuities to Bath Chairmen	16 10 0	
43	Miscellaneous Payments	12 18 2	
—	Storage of Butter	7 7 0	
362			481 10 1
	EXPENSES OF TRIALS:—		
33	Consulting Engineers and Assistants	49 10 0	
28	Hotel and Travelling Expenses	22 12 8	
62			72 2 8
39	Fruit-drying Demonstration		16 11 7
18,140	Total Expenditure		25,479 8 9
3,600	Balance carried to Balance Sheet (page xii)		4,074 0 1
			£29,553 8 10

Examined, audited, and found correct, this 6th day of December, 1897.

A. H. JOHNSON, C. G. ROBERTS } *Auditors on behalf of the Society.*

Table showing the Number of GOVERNORS and MEMBERS in each Year from the Establishment of the Society.

Year ending with Show of	President of the Year	Governors		Members			Total
		Life	Annual	Life	Annual	Honorary	
1839	3rd Earl Spencer	—	—	—	—	—	1,100
1840	5th Duke of Richmond	86	189	146	2,431	5	2,860
1841	Mr. Philip Pusey	91	219	231	4,047	7	4,595
1842	Mr. Henry Handley	101	211	328	5,194	15	5,849
1843	4th Earl of Hardwicke	94	209	429	6,155	15	6,902[1]
1844	3rd Earl Spencer	95	214	442	6,161	15	6,927
1845	5th Duke of Richmond	94	198	527	5,899	15	6,733
1846	1st Viscount Portman	92	201	554	6,105	19	6,971
1847	6th Earl of Egmont	91	195	607	5,478	20	6,391
1848	2nd Earl of Yarborough	93	186	648	5,387	21	6,335
1849	3rd Earl of Chichester	89	178	582	4,643	20	5,512
1850	4th Marquis of Downshire	90	169	627	4,356	19	5,261
1851	5th Duke of Richmond	91	162	674	4,175	19	5,121
1852	2nd Earl of Ducie	93	156	711	4,002	19	4,981
1853	2nd Lord Ashburton	90	147	739	3,928	19	4,923
1854	Mr. Philip Pusey	88	146	771	4,152	20	5,177
1855	Mr. William Miles, M.P.	89	141	795	3,838	19	4,882
1856	1st Viscount Portman	85	139	839	3,896	20	4,979
1857	Viscount Ossington	83	137	896	3,933	19	5,068
1858	6th Lord Berners	81	133	904	4,010	18	5,146
1859	7th Duke of Marlborough	78	130	927	4,008	18	5,161
1860	5th Lord Walsingham	72	119	927	4,047	18	5,183
1861	4th Earl of Powis	84	90	1,118	3,328	18	4,633
1862	H.R.H. The Prince Consort; 1st Viscount Portman	83	97	1,151	3,475	17	4,823
1863	Viscount Eversley	80	88	1,263	3,735	17	5,183
1864	2nd Lord Feversham	78	45	1,343	4,013	17	5,496
1865	Sir E. C. Kerrison, Bt., M.P.	79	81	1,386	4,190	16	5,752
1866	1st Lord Tredegar	79	84	1,395	4,049	15	5,622
1867	Mr. H. S. Thompson	77	82	1,388	3,903	15	5,465
1868	6th Duke of Richmond	75	74	1,409	3,888	15	5,461
1869	H.R.H. Prince of Wales	75	73	1,417	3,864	17	5,446
1870	7th Duke of Devonshire	74	74	1,511	3,764	15	5,438
1871	6th Lord Vernon	72	74	1,589	3,896	17	5,648
1872	Sir W. W. Wynn, Bt., M.P.	71	73	1,655	3,953	14	5,766
1873	3rd Earl Cathcart	74	62	1,832	3,936	12	5,916
1874	Mr. Edward Holland	76	58	1,944	3,756	12	5,846
1875	Viscount Bridport	79	79	2,058	3,918	11	6,145
1876	2nd Lord Chesham	83	78	2,164	4,013	11	6,349
1877	Lord Skelmersdale	81	76	2,239	4,073	17	6,486
1878	Col. Kingscote, C.B., M.P.	81	72	2,328	4,130	26	6,637
1879	H.R.H. The Prince of Wales, K.G.	81	72	2,453	4,700	26	7,332
1880	9th Duke of Bedford	83	70	2,673	5,083	20	7,929
1881	Mr. William Wells	85	69	2,765	5,041	19	7,979
1882	Mr. John Dent Dent	82	71	2,849	5,059	19	8,080
1883	6th Duke of Richmond & Gordon	78	71	2,979	4,952	19	8,099
1884	Sir Brandreth Gibbs	72	72	3,203	5,408	21	8,776
1885	Sir M. Lopes, Bart., M.P.	71	69	3,356	5,619	20	9,135
1886	H.R.H. The Prince of Wales, K.G.	70	61	3,414	5,569	20	9,134
1887	Lord Egerton of Tatton	71	64	3,440	5,387	20	8,982
1888	Sir M. W. Ridley, Bt., M.P.	66	56	3,521	5,225	16	8,884
1889	Her Majesty The Queen	73	58	3,567	7,153	15	10,866
1890	Lord Moreton	122	58	3,846	6,941	17	10,984
1891	2nd Earl of Ravensworth	117	60	3,811	6,921	19	10,928
1892	Earl of Feversham	111	69	3,784	7,066	20	11,050
1893	Duke of Westminster, K.G.	107	74	3,786	7,138	21	11,126
1894	8th Duke of Devonshire, K.G.	113	73	3,798	7,212	22	11,218
1895	Sir J. H. Thorold, Bart.	120	80	3,747	7,179	23	11,149
1896	Sir Walter Gilbey, Bart.	126	83	3,695	7,253	23	11,180
1897	H.R.H. The Duke of York, K.G.	126	83	3,705	7,285	24	11,223
1898 Mar.	Earl Spencer, K.G.	121	80	3,682	7,197	25	11,105

[1] The figures for 1843 are taken from the December report, after the removal of the names of members who had discontinued their subscriptions; but it was reported in the previous May that 1,436 had been elected during the preceding twelve months, bringing the then nominal total to 7,285. In all other cases, from 1840 to 1897, the figures are from the reports of the Council to the anniversary meeting in May. It should, however, be observed that the totals were occasionally affected by the necessary revision of the list.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, FEBRUARY 2, 1898.

EARL SPENCER, K.G. (PRESIDENT), IN THE CHAIR.

Present:

Trustees.—Colonel Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart.

Vice-President.—Sir John Thorold, Bart.

Other Members of Council.—Mr. J. H. Arkwright, the Duke of Bedford, Mr. George Blake, Mr. J. Bowen-Jones, Mr. F. S. W. Cornwallis, the Earl of Coventry, Mr. Percy E. Crutchley, Mr. Alfred Darby, Mr. J. Marshall Dugdale, Mr. S. P. Foster, Mr. W. Frankish, Mr. Hugh Gorringe, Mr. R. Neville Grenville, Mr. James Hornsby, the Earl of Jersey, G.C.M.G., Mr. C. S. Mainwaring, Mr. T. H. Miller, the Hon. Cecil T. Parker, Mr. A. E. Pease, M.P., Mr. Albert Pell, Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. C. C. Rogers, Mr. S. Rowlandson, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. A. J. Smith, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. R. Stratton, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. C. W. Wilson, Sir Jacob Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. R. S. Burgess, Superintendent of the Showyard.

Professor Sir George Brown, C.B.; Professor McFadyean.

Mr. W. H. Lythall, Secretary of the Birmingham Local Committee.

Apologies for non-attendance were received from the Earl of Derby, K.G., Earl Egerton of Tatton, Viscount Emlyn, Lord Brougham and Vaux, Lord Moreton, Mr. Alfred Ashworth, Mr. H. Chandos-Pole-Gell, Mr. Henry D. Marshall, Mr. P. A. Muntz, M.P., and Mr. Charles Whitehead.

The minutes of the last meeting of the Council, held on December 8, 1897, having been taken as read and approved,

The PRESIDENT said that before they proceeded with the ordinary business of the meeting, he thought the Council would allow him to make an observation on an event which had recently taken place. They would have noticed amongst the honours bestowed at the beginning of the New Year a name which was very familiar to them. He thought they might congratulate themselves upon the compliment paid to the Royal Agricultural Society by Her Majesty conferring an honour upon their Secretary; and he was sure they would also join with him in congratulating Sir Ernest Clarke on his well-deserved distinction. He was quite certain that no Society had had an abler or more efficient Secretary. (Hear, hear.) It was an unusual thing to have an honour thus conferred, and he was sure they would rejoice with him in what had taken place. While saying this, he might also congratulate a very old friend of his own upon receiving a similar honour. Sir George Brown was an

old servant of the Privy Council, with whom he in former days had acted from time to time. Sir George was a most efficient officer, as well as one of the leading men in the veterinary science of this country. (Hear, hear.)

Sir GEORGE BROWN begged the Council to be good enough to accept his grateful thanks for the compliment which had been paid to him in commenting, as the President had done, upon the honour which he had received.

Sir ERNEST CLARKE said that he was deeply touched by the generous reference which the President had made to himself, and by the cordial manner in which the Council had endorsed his Lordship's remarks. He regarded it as his greatest good fortune that he possessed the confidence of the Council, and he thanked them from the bottom of his heart for all the kindly consideration and goodwill that they had shown him during his tenure of the honourable office which he was privileged to hold. It was highly gratifying to his feelings that the honour which had been bestowed by the Queen upon his fortunate self had been so generally regarded by the Council and the members of the Society as a recognition of the splendid public work, during the whole of Her Majesty's reign, of the grand old Society which he was so proud to serve, and to whose interests he hoped, by their favour, to be permitted to devote himself so long as health and strength should last.

Election of New Governor and Members.

The following Governor and sixty-one new members were elected:—

Governor.

HEYWOOD, Sir Arthur Percival, Bart...Duffield Bank, Derby.

Members.

ADKINS, W. R. D...Springfield, Northampton.
ALLSOPP, Lieut.-Col. the Hon. W. H...Junior Carlton Club, S.W.
BAIRD, Capt. E. W. D...Exning House, Newmarket.
BARNES, H. S...St. George's Club, W.
BARRON, Mrs. W...Taplow House, Bucks.
BIDWELL, G. S...Drayton Manor, Tamworth.
BIRTLES, P. H...Micklow Ho., Stone, Staffs.
BLAKEWAY, J...Upper Dean St., Birmingham.
BROOKS, J...Childerley Hall, Cambridge.
BRUTON, H. W...Albion Chambers, Gloucester.
BRYANS, A. W...Deansfield, Brewood, Staffs.
BURRY, A. P...Sompting, Worthing.
CARR, R. C. W...Rock Hall, Alnwick.
CLARKE, H. J...148 Queen's Road, Aston.
COX, C. H...Eggwood, Meniott, Crewkerne.
CRAGG, A. R...Maristow, Roborough.
CROWHURST, H...Marden, Kent.
DAY, G...Bishampton, Pershore.
DEVAS, H. G...Hartfield, Hayes, Kent.
EDMONDSON, T...Corn Market, Penrith.
GASCOYNE, E. B...Bapchild Ct., Sittingbourne.
GEAKE, W...St. Keyne, Cornwall.
GRAHAM, G...Pallett's Farm, Newport, Essex.
HALL, R. W...Ashton, Leominster.
HEDDLE, J. F. O...Ifield Court, Sussex.
HOGG, J. A...Appleby Castle, Appleby.
HOULTON, W...Broadfield Farm, Northleach.
INGHAM, C. H...Dalton Holme, Hull.
INGRAM, J. C...Cobbe Place, Beddingham.
JENKINS, J. L...Lisvane, Cardiff.
JOHNSON, D...Middleton Hall, Mendham, Harleston.
KELHAM, Mrs. L...Bourne Lodge, Boxmoor.
KNIGHT, W. J...Wishaw, Erdington, Birmingham.
KNOWLES, H...Albion Chambers, Gloucester.
LOCKWOOD, C. H...Eastwood Farm, Rotherham.
MASTER, A. C...Heckfield, Winchfield
MULLOCK, G. H...Poulton, Pulford, Wrexham.
NORWOOD, W. W...Conisboro', Rotherham.
PAGE, L. H...Bobbing Court, Sittingbourne.
PAGET, C. E...County Hall, Northampton.
PARKER, J. H...The Court House, Malvern.
PARKER, John..Atherstone.
PARKYN, F. A...Bockhampton Farm, Lambourn.
PARSONS, Charles..Nuneaton.
PRICKETT, G. F...Bridge Street, Walsall.
RIGG, Henry..Weeford Park Farm, Tamworth.
ROOT, Goodman..Lancaster Road, Harrogate.
RUDDER, H...Chester Street, Birmingham.
SHAW, J...Maidstone Road, Rochester.
SMITH, J. A...Fazakerley, Liverpool.
TAILBY, Mark..Dalton St., Birmingham.
THOMAS, Evan..Calwynick, Builth Wells.
TIDY, H...Middleton, Tamworth.
TOMPSETT, Wm...Paddock Wood, Kent.
VERCOE, H...Pendarves, Camborne.
WALLER, E...Packington Rectory, Meriden, Coventry.
WATERSTON, C...Flodden, Wooler.
WHITFIELD, G. H...Cheswell Grange, Newport, Salop.
WRIGHT, George A...Stonnall, Walsall.
WYATT, H...Walton Grange, Aylesbury.
YOUNG, M...Currock House, Carlisle.

The Reports of the various Standing Committees were then presented and adopted as below:—

Finance.

Sir NIGEL KINGSCOTE reported his election as Chairman of the year. The accounts for the month ended December 31, 1897, as certified by the Society's accountants, showed total receipts amounting to 2,840*l.* 19*s.* 7*d.*, and expenditure amounting to 3,078*l.* 0*s.* 11*d.* . The accounts for the period ended January 29, 1898,

which were also presented, showed total receipts amounting to 6,734*l.* 14*s.* 11*d.*, and expenditure amounting to 244*l.* 10*s.* 3*d.* Accounts amounting in all to 2,763*l.* 16*s.* 6*d.* had been passed and were recommended for payment. The quarterly statement of subscriptions, arrears, and property had been laid upon the table.

House.

Sir NIGEL KINGSCOTE reported his election as Chairman of the year, and presented the Committee's recommendations as to the repainting of the house.

Journal.

Sir JOHN THOROLD reported his election as Chairman of the year. Copies of the Journal for December 31, 1897, which had been duly issued to members, were laid upon the table. The Committee desired to record their indebtedness to Sir John Lawes and Sir Henry Gilbert for their valuable contribution to this number on "The Valuation of Unexhausted Manures," and to Mr. Albert Pell for his interesting review of the Duke of Bedford's "Story of a Great Agricultural Estate." In view of the fact that the article on the Valuation of Unexhausted Manures by Sir John Lawes and Sir Henry Gilbert superseded the Society's pamphlet on this subject by the same authors, the Committee had considered the question as to whether the pamphlet should be re-issued in its revised form. They decided that as the article was available in the Journal at the price of 3*s.* 6*d.*, it was not necessary to reprint it at present. Directions had been given with respect to the contents of the next number of the Journal, and as to a variety of suggested articles and notes. The Committee would include in the March number of the Journal the Report by the Chemist and Botanist on the Grass Experiments, as recommended by the Chemical Committee (see p. 137). The Secretary had been authorised to issue a circular to the Governors of the Society, giving them the option of receiving their Library copy of the Journal in a bound form at the end of each year, instead of in paper covers as at present.

Chemical and Woburn.

Mr. WARREN reported that Lord Emlyn had been elected Chairman of the year. In connection with the "Pot Culture" Station and the experiments under the "Hills Bequest" at Woburn, the Consulting Chemist had reported that the fitting-up of the laboratory was practically completed, and that his assistant had taken up his residence on the spot, so that he would henceforth be engaged continuously in the work of the Woburn Experiments and of the "Pot Culture" establishment. Proofs of an interim report on the Grass Experiments by the Consulting Chemist and Consulting Botanist had been submitted, and the Committee considered it advisable that this report should be published in the Journal, in order to give an account of the progress of the experiments so far as they had proceeded (see p. 137). The Committee called the attention of members to the fact that several cases had recently been brought to their notice in which basic slag, inferior to the quality guaranteed, had been supplied, and they urged the necessity of having deliveries checked by analysis.

Botanical and Zoological.

Mr. WHEELER reported that Mr. Whitehead had been elected Chairman of the year. The Consulting Botanist had presented the following Report:—

Twenty-eight inquiries have been received since the last Report. These have referred chiefly to the quality of seeds. The mildness of the winter has been favourable to the growth of fungi. Cases of the destruction of clover by the parasitic fungus *Sclerotinia Trifoliorum* have been investigated from Surrey, Gloucester, and Lincoln. This parasite shows itself by the dark, almost black irregular-shaped spots on the leaves. These are the spores of the fungus, which burst through the skin of the leaf, and are carried by the air to attack other clovers. The mycelium or roots of the fungus pushes its way through the parts of the plant above ground, killing them and reducing them to a wet, disorganised pulp. It forms in the dead stems little masses of hard, compact mycelium, called *Sclerotia*, which, after a period of rest, develop a minute *Peziza*, bearing spores that begin a new stage in the

life history of the parasite. This form of clover-sickness seems to prevail over the country this winter. From Lincolnshire I have also received clover-sick plants where the injury was due to *Peronospora Trifolii*. Both of these parasitic fungi live in the interior of the attacked plants. It is consequently impossible to arrest the disease after it has made its appearance. But to prevent its recurrence the growth of clover in the diseased field should be discontinued for several years, and a good dressing of lime would probably kill the spores, and at the same time help the pasture.

(Signed) WILLIAM CARRUTHERS.

February 1, 1898.

A report presented by the Zoologist (Mr. Cecil Warburton) stated that since the last meeting information had been given with regard to various insect pests, chiefly those affecting fruit trees.

Veterinary.

The Hon. CECIL PARKER reported his election as Chairman of the year, in the room of Mr. Alfred Ashworth, whose uncertain health necessitated his retirement. The Committee recommended that Lord Brougham and Vaux be added to their number. A letter had been received from the Worshipful Company of Farriers offering the Freedom of the Company to the first prize-winners at the Society's Horse Shoeing Competitions at Birmingham, as on previous occasions. This offer had been accepted with thanks. Professor McFadyean had reported the steps which he proposed taking with reference to further experiments at the Royal Veterinary College into the subject of abortion in cattle; and Colonel Curtis-Hayward had stated that, in an epidemic of the disease upon a farm near Gloucester, the treatment recommended by the Society had appeared to be thoroughly successful. Sir Nigel Kingscote and the Secretary had had an interview with the President of the Local Government Board on December 13, 1897, with reference to the question of cubic air-space in dairies and cowsheds, and a letter dated December 28, 1897, had since been received from the Board in answer to the Society's representations. The Secretary's note on this subject in the last number of the Journal, with the letter from the Local Government Board, had been reprinted and issued in the form of a pamphlet, for which there had been a large demand from local authorities and others interested. The following was the text of the letter from the Local Government Board :—

CUBIC SPACE IN COWSHEDS.

Local Government Board,
(Copy.) Whitehall, S.W.
December 28, 1897.

SIR,—I am directed by the Local Government Board to advert to the interview which Colonel Sir Nigel Kingscote and yourself, acting on behalf of the Royal Agricultural Society of England, had with the President of the Board relative to the cubic space required to be provided in cowsheds in the occupation of persons following the trade of a cowkeeper or dairyman.

As you are aware, the Dairies, Cowsheds and Milkshops Order of 1885, which was made by the Lords of Her Majesty's Privy Council under Section 34 of the Contagious Diseases (Animals) Act, 1878, enables local authorities, from time to time, to make regulations for various purposes, and amongst others, "for prescribing and regulating the lighting, ventilation, cleansing, drainage and water supply of dairies and cowsheds in the occupation of persons following the trade of cowkeepers or dairymen." By the Contagious Diseases (Animals) Act, 1886, the powers of the Privy Council for the purposes of the Section and Order above mentioned were transferred to the Board, and the bodies who have since become Urban and Rural District Councils were made the local authorities for these purposes.

Since that time, a large number of local authorities have made regulations under the Order, and many of these regulations contain provisions prescribing a minimum amount of cubic air space for each cow kept in a cowshed in the occupation of a cowkeeper or dairyman.

It appears that it has been supposed that the regulations made by the local authorities on this subject are based on Model Regulations issued by the Board; but it is evident that there is some misapprehension in this matter. The Board have not issued any Model Regulations on any of the subjects with respect to which District Councils can make Regulations under the Order of 1885. It is true that several of the publishers of books and forms relating to local government have issued forms for the use of local authorities in preparing Regulations under the Order, but these forms have not been issued with the approval of the Board, who have been in no way concerned in the matter.

The forms differ with regard to the requirement of cubic space in cowsheds. Two of them prohibit the keeping of more cows in any cowshed than will admit of a certain amount of cubic air space for each cow, and in one of these cases a note is appended to the effect that the Board have advised the adoption of not less than 800 cubic feet in respect of each cow.

But this is misleading. It is true that the Board, in dealing with some particular cases which have come before them, have expressed an opinion that not less than 800 cubic feet of air space per cow should be

required. But they do not consider that this amount of air space should necessarily be provided in all circumstances, and as a matter of fact the amount required by different District Councils varies considerably.

The third series makes no requirement whatever in respect of cubic space per cow.

The Board think it desirable that a minimum amount of cubic space should be prescribed in respect of each cow, and in the case of Baker *v.* Williams, 66 L.J., Q.B.D., 880, it has been expressly decided that a Regulation may legally be made for this purpose; but it rests with the District Council to determine whether they will exercise their power of making such a Regulation, and if so, what the amount of cubic space required shall be, subject only to this, that Article 14 (3) of the Order of 1885, as amended by the Dairies, Cowsheds and Milkshops Amending Order of 1886, provides that if the Board "are satisfied on inquiry with respect to any regulation that the same is of too restrictive a character or otherwise objectionable, and direct its revocation, the same shall not come into operation, or shall thereupon cease to operate, as the case may be."

It was suggested at the interview that the Board should themselves issue Model forms for the use of District Councils in framing Regulations under the Order of 1885. The Board will give careful consideration to this suggestion; but as they understand that the Royal Commission on Tuberculosis have had their attention drawn to the question of air space in cowsheds, and that the Commissioners are now engaged upon their Report, it seems to the Board to be desirable that any action of this kind should be deferred until the Report of the Commission has been issued.

I am, Sir, your obedient servant,
(Signed) S. B. PROVIS,
Assistant Secretary.

ERNEST CLARKE, Esq.,
Secretary to the Royal Agricultural
Society of England.

Stock Prizes.

Mr. SANDAY reported his election as Chairman of the year. The following Champion Prizes had been received since the last Meeting of the Council; and as they all complied with the Society's conditions, the Chairman had provisionally accepted them, and authorised their publication in the prize-sheet:—

Polo Pony Stud-Book Society.—Two gold medals for the best stallion and brood mare.

Lincoln Longwool Sheep Breeders' Association.—Prize of 10*l*. 10*s*. for the best Lincoln ram.

Suffolk Sheep Society.—Gold medal for the best Suffolk ram.

British Berkshire Society.—Prize of 5*l*. for the best Berkshire boar or sow.

The Secretary had reported the publication of the prize-sheet, which was now being issued to last year's exhibitors and to applicants generally. A letter had been read from Mr. John Tudge stating that his Hereford cow "Miss Gift," No. 1199 in Class 107, which was awarded the Second Prize of 10*l*. in her class at the Manchester Meeting, had failed to comply with the Society's regulations as to calving, and the Committee recommended the cancellation of the cheque drawn in respect of this animal, and the drawing of a new cheque for 10*l*. in favour of Mr. H. S. Tomasson, of Plumpton, Penistone, the exhibitor of the Reserve Number, "Arthington Rhodiola 3rd," No. 1198, which was exhibited as "in-milk," having calved on February 28, 1897. Various letters from Breed societies as to the prizes offered by the Society had been of necessity postponed for consideration when the prize-sheet for the Country Meeting of 1899 was being prepared.

Judges' Selection.

Mr. SANDAY (Chairman) reported that the Committee had selected the names of gentlemen to be invited to act as Judges in the several Departments for the Birmingham Meeting, and they recommended that letters be addressed to them forthwith, the invitation to act being on condition that they do not act as Judges of the same class of stock at the Meeting of either the Bath and West of England Society or the Royal Counties Agricultural Society to be held this year. (For list, see p. xxxv).

Implement.

Mr. FRANKISH reported his election as Chairman of the year. The Implement prize sheet and regulations for the Birmingham Meeting had been duly issued. Inquiries having been received as to whether the machines used in the trials of the methods for safe-guarding chaff-cutters would be worked by steam or other power, the Committee recommended that replies be sent to the effect that the prize was offered for the best methods of safeguarding chaff-cutters to comply with the Chaff-cutting Machines (Accidents) Act, 1897, which referred to machines worked by any motive power other than manual labour.

The Committee had considered the suggestion made by Mr. W. Lipscomb at the General Meeting on December 9 last, with reference to traction engines on country roads, but they could not recommend that the Society should take any action in this matter.

General Birmingham.

The Hon. CECIL PARKER reported that apologies for non-attendance had been received from the Lord Mayor of Birmingham, Mr. E. Nettlefold, and Mr. H. A. Wiggin, as representatives of the Birmingham Local Committee. In accordance with the recommendation of the Local Committee, the following agents for the sale of season tickets and for the disposal of dairy produce had been appointed, viz.—

(1) *For the Sale of Season Tickets.*—Messrs. Stanford and Mann, 73 New Street, Birmingham; Mrs. Breutnall, 14 High Street, Sutton Coldfield.

(2) *For the Sale of Dairy Produce.*—Barrow's Stores, Limited, 74, 76, and 78 Corporation Street, Birmingham.

The Committee had approved of the regulations and entry forms for the prizes offered for draught horses in harness, and they recommended that the animals be paraded at 2.30 p.m. on Thursday, June 23, 1898. They also recommended that the price of admission to the Grand Stand be fixed at 2*s.* per person on the 5*s.* and 2*s.* 6*d.* days, and 1*s.* per person on the 1*s.* days, as usual. Letters had been received from the London and North Western and Midland Railway Companies, stating the rates proposed to be charged for the conveyance of passengers during the Show, and for the cartage of stock and implements between the stations at Sutton Coldfield and the Showyard.

Showyard Works.

Sir JACOB WILSON reported his election as Chairman of the year. He announced the death from pneumonia on January 5 last of the Society's late Surveyor, Mr. James Bennison. The plant required for the Birmingham Meeting was being forwarded to Four Oaks Park from Maidstone. The levelling of the Showyard was being proceeded with by the Local Committee, and the delivery of the plant and timber would commence during the present week. Progress had been made with the arrangements for refreshments in the Showyard, for the advertising and bill-posting, and with other matters connected with the preparations for the Show.

Sir JACOB WILSON, in presenting the report of this Committee, said that, as they would have observed from the very appropriate remarks which their President had made at the commencement of their proceedings, the Council shared in the joys of their officials: the Council also sympathised with them in their sorrows. By the death of Mr. James Bennison, a young life of much original promise had suddenly come to an end; and he felt sure the Council would not wish this event to be allowed to pass over without expressing their sympathy with Mr. Wilson Bennison, the Society's Consulting Surveyor, in his domestic sorrow. (Hear, hear.)

Selection.

Sir JOHN THOROLD reported his election as Chairman of the year. The Committee recommended that Mr. J. C. Williams, of Caerhays Castle, St. Austell, nominated at the December Meeting, be elected a member of the Council, in the room of Mr. Tremayne, resigned. The Committee had received with great regret an intimation from the Hon. Cecil Parker that, owing to the increasing calls upon his time, he felt it would be necessary for him, on the conclusion of his present period of office, to retire from the post of Honorary Director. As Mr. Parker's term of office would expire after the conclusion of the Birmingham Meeting, and it was indispensably necessary that his successor should have an opportunity of learning the details of the duties at the Birmingham Show, the Committee recommended that Mr. Percy Crutchley be asked to accept the office of Honorary Director for the three years following the Birmingham Meeting. The Committee were glad to report that Mr Crutchley had expressed his willingness to undertake the duties, if it should be the wish of the

Council to appoint him. As Mr. Crutchley would, under the above circumstances, be unable to fulfil the duties of Steward of Dairying, the Committee recommended that Mr. J. Marshall Dugdale be requested to act in that capacity for the Birmingham Meeting.

Selection of New Honorary Director.

Sir JOHN THOROLD added that this was not the occasion on which they could recognise as they would wish the great services which Mr. Parker had rendered to the Society, because much of his term of office had still to run; but they would hope at some future time to make a suitable acknowledgment of the excellent work that he had done. He would only ask the Council to approve of the recommendation of the Committee of Selection that Mr. Crutchley be appointed to succeed Mr. Parker upon the conclusion of his term of office. He was quite sure that all the Council who knew Mr. Crutchley would agree that he had done good work for the Society, and they believed that he would be able to do his duty in that position which they now asked him to accept. He had had some difficulty in getting over the diffidence felt by Mr. Crutchley in undertaking this office; but he was quite sure that with the support of all the officers of the Society, as well as of the members generally, he (Mr. Crutchley) would find the task less difficult than he anticipated.

The Hon. CECIL PARKER thought it was due to the Council that he should say a few words upon this matter. They would be aware from what Sir John Thorold had stated that his term of office as Honorary Director did not expire until the conclusion of the Birmingham Meeting. He hoped, however, that it would not be considered presumptuous and egotistical on his part, if he believed that the Council would have elected him for a further period. As his term of office did expire after the Birmingham Meeting, it would have been manifestly unfair to wait until that time before announcing his wish to retire. By giving notice now, his successor would be able to work with him during the forthcoming Show, and thus become familiar with the innumerable details connected with the administration of the Society. His reasons for retiring were of a purely private character. He had lately had a great deal more work thrust upon him, and, with the increasing amount of work which the Honorary Directorship of the Society's Shows involved, he found that it would be impossible to do both in a manner that would be satisfactory to himself and to the Society. The period during which he had held office had been a most pleasant one; and if it had not been for the loyalty, support, and co-operation given to him by so many of the members, and also for the encouragement which he had received, it would have been impossible for him to carry out the work. He had made many friends, and, he hoped, few enemies. He thanked the Council and all connected with the Society for the assistance they had given him during his term of office.

The PRESIDENT said he thought he should only be doing what the Council desired, in expressing on their behalf the regret with which they had heard Mr. Cecil Parker's announcement. They would have, no doubt, a further opportunity of expressing their thanks to him when his term of office actually expired; but he thought they would wish him to express their sense of the very efficient way in which the duties had been performed. He felt very little doubt that Mr. Crutchley would be a worthy successor to Mr. Parker, and he could not say more than that.

The motion that the report of the Committee be adopted having been carried unanimously,

Mr. CRUTCHLEY desired briefly to return thanks for the honour the Council had done him in asking him to undertake this work. He was very conscious of the difficulties that he would have in succeeding those gentlemen who had so worthily filled the office of Honorary Director in the past; but he was encouraged to undertake the duties from the knowledge of the support which was always forthcoming from the

Stewards, from the Members of Council, and from all the Society's officers. He could only say that he would do his best to carry out the duties.

On the motion of Sir JOHN THOROLD, seconded by Sir NIGEL KINGSCOTE, Mr. J. C. Williams, of Caerhays Castle, St. Austell, was formally elected a Member of Council, in the room of Mr. John Tremayne, resigned.

Education.

Mr. SUTTON reported the election of Lord Moreton as Chairman of the year. The Committee had fixed September 26 to 30 next as the date for the holding in England of the Examination for the National Diploma in the Science and Practice of Dairying. The Highland Society's Examination for the same Diploma would take place in Scotland in the following week, from October 4 to 7.

Dairy.

Mr. CRUTCHLEY reported his election as Chairman of the year, in succession to the Hon. Cecil Parker, who had been appointed Chairman of the Veterinary Committee. Details connected with the Dairy for the Birmingham Meeting had been discussed, and the names of Judges of butter and cheese had been nominated for the consideration of the Judges' Selection Committee.

Invitation from Cardiff.

The SECRETARY read a letter which had been received since the agenda paper was printed from the Town Council of Cardiff, inviting the Society to hold its Country Meeting at that town. The Society's thanks were ordered to be sent for this communication, which would receive further consideration at a future meeting.

Miscellaneous.

The agreement with the city of Birmingham for the Country Meeting of 1898, and the endorsement of the agreement with the borough of Maidstone for the postponement of the Maidstone Meeting until 1899, which had been duly sealed by the respective Corporations, were laid upon the table; and the Society's seal was affixed to the other parts of these agreements, on the motion of Sir JACOB WILSON, seconded by the Hon. CECIL PARKER.

Date of Next Meeting.

Other letters and documents having been laid upon the table, the Council adjourned until Wednesday, March 2 next at noon.

WEDNESDAY, MARCH 2, 1898.

EARL SPENCER, K.G. (PRESIDENT), IN THE CHAIR.

Present:

Trustees.—Colonel Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., the Duke of Richmond and Gordon, K.G., the Right Hon. Sir M. W. Ridley, Bart., M.P.

Vice-Presidents. — The Earl of Feversham, Lord Moreton, Sir John Thorold, Bart Mr. Charles Whitehead.

Other Members of Council.—Mr. J. H. Arkwright, the Duke of Bedford, Mr. F. S. W. Cornwallis, the Earl of Coventry, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. J. Marshall Dugdale, Mr. W. Frankish, Mr. Hugh Gorringe, the Marquis of Granby, Mr. R. Neville Grenville, Mr. James Hornsby, Capt. W. S. B. Levett, Mr. Henry D. Marshall, the Hon. Cecil T. Parker, Mr. Albert Pell, Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. C. C. Rogers, Mr. S. Rowlandson, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. A. J. Smith, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. Martin J. Sutton, Mr. J. P. Terry, Mr. R. A. Warren, Mr. J. C. Williams, Sir Jacob Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. W. Carruthers, F.R.S., Consulting Botanist; Mr. R. S. Burgess, Superintendent of the Showyard.

Professor Sir George Brown, C.B.

Apologies for non-attendance were received from the Earl of Derby, K.G., Viscount Emlyn, Lord Brougham and Vaux, Mr. Alfred Ashworth, Mr. George Blake, Mr. H. Chandos-Pole-Gell, Mr. Alfred Darby, Mr. C. S. Mainwaring, Mr. P. A. Muntz, M.P., and Mr. Howard P. Ryland.

Election of New Governor and Members.

The minutes of the last monthly meeting of the Council, held on February 2, 1898, having been taken as read and approved, the election of the following Governor and thirty-eight members was proceeded with:—

Governor.

HODGSON, John..Nocton Hall, Nocton, Lincoln.

Members.

BEATTIE, J...Gewern Hafod, Maesbury.
BEMROSE, F...Woodville, Litchurch, Derby.
BIBBY, F...Rhydorddwy Fawr, Rhyl.
COLLIER, C. J...Norton, Derbyshire.
CROUCHER, E...Bower Mount, E. Peckham.
CURRIE, Wm. C...10 Falkland Rd., Egremont.
DE LUSSAN, A...Woodcroft Castle, Market Deeping.
DU CROS, H...Cornbury Park, Charlbury.
DYER, N...Bredon, Worc.
ECCLES, J...15 Durham Villas, Kensington, W.
FENNELL, W. J...Rathside, Ballytore, co. Kildare.
GLYNN, E. F...25 Great George St., Bristol.
GRAHAM, R...Crowe Farm, Stutton, Ipswich.
GREAME, Y. G. L...Sewerby House, Hull.
HALL, J...Dunham Massey, Altrincham.
HARRISON, G. E...Goring, Worthing.
HARRISON, W. T...Gravelly Hill, Birmingham.
HAWDON, J...Seywell Grounds, Towcester.
HINE, G. T...35 Parliament Street, S.W.
HINE, T. G. M...283 Oxford Street, W.
HORWOOD, G. F...Sanday, Kirkwall, N.B.
JONES, W. H...Eaton Hastings, Faringdon.
KING, John B...Bignell, Bicester.
LAW, A. W...Mains of Sanquhar, Forres, N.B.
LAWRENCE, W. T...Newton Rigg, Penrith.
MARTIN, R. B., M.P...Overbury Ct., Tewkesbury.
NETTLEFOLD, E...Westbourne, Edgbaston.
NEWTON, W. A...Fordham, Soham.
NODEN, T. R...Bridgemere Hall, Nantwich.
PEEL, B. W...2 Victoria Road, Cirencester.
PRIESTLEY, F. J. L...Heneglwys Rectory, Llangefni.
REDMAYNE, L...Cranwell Lodge, Shawsworth, Blackburn.
SCOTT, Guy H. G...41 Lexham Gardens, W.
SHUTT, E...Burghill, Hereford.
TAYLOR, E. J...High Wood, Uttoxeter.
TREWEEKE, W. A...Churchill, Chipping Norton.
WHITFIELD, R. R...Rodidge Farm, Fradley, Lichfield.
WILSON, E...5a Duke St., Grosvenor Sq., W.

New Member of Council.

Sir JOHN THOROLD, Chairman of the Committee of Selection, introduced Mr. J. C. Williams, of Caerhays Castle, St. Austell, who was elected as a member of the Council on February 2, 1898, and who now attended for the first time.

The Reports of the various Standing

Committees were presented and adopted as below :—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the period ended February 26, 1898, as certified by the Society's accountants, showed total receipts amounting to 1,120*l.* 15*s.* 2*d.*, and expenditure amounting to 1,768*l.* 1*s* 6*d.* Accounts amounting in all to 3,631*l.* 0*s* 8*d.* had been passed, and were recommended for payment

Sir NIGEL KINGSCOTE also laid upon the table the balance sheet of the Society for the year 1897 (see pages xii xiv), and said that there were no features in it which appeared to call for special comment, except the gratifying one that, as the result of the year's working, the Society's total assets had increased from 45,875*l.* to 48,572*l.*, or as nearly as possible 2,700*l.* more than last year. Under the new system of the allocation of a share of the expenses of the secretarial department to the Showyard account, as fully explained in the Report of the Council to the last general meeting in December (vol. viii. 1897, page 715) the total expenditure during the year on the Ordinary Account was 9,921*l.* (the individual items being much the same as in 1896). As the receipts from subscriptions and from the contribution to revenue in respect of the 3,900 life members amounted to 10,558*l.*, there was a balance of 637*l.* to the credit of the Ordinary Account. The total receipts at the Manchester Meeting were, as reported last December, 29,553*l.*, and the expenditure was 25,479*l.*, or a gross profit of 4,074*l.* on the Show Account, making a total gross profit of 4,711*l.* for 1897. Against this had to be set the depreciation in the Society's fixtures, furniture, machinery, and country meeting plant, amounting to 762*l.*, and the contribution to Revenue from the Reserve Fund in respect of the cost of providing life members with their privileges, which made the net increase of the Society's assets 2,700*l.* Acting upon the policy expressed in the report of the Council to the General Meeting of May 22, 1895, of increasing, as opportunity offers, the Society's interest in the Harewood House Debenture Stock, secured on the house which the Society now occupies, the Finance Committee had recently purchased 2,700*l.* more of such stock, as representing the net increase in the assets during 1897; so that the invested funds of the Society at the end of 1897, as they would appear in the balance-sheet (16,000*l.* Consols and 15,600*l.* Harewood House Stock), had been now increased to 16,000*l.* Consols and 18,300*l.* Harewood House Stock. The other principal assets of the Society were :—Fixtures, 3,497*l.*; furniture, 3,262*l.*; books and pictures, 1,500*l.*; machinery, 687*l.*; country meeting plant. 4,625*l.*; and the "Pot Experiments" buildings just erected at Woburn, 1,069*l.* The latter it was proposed to write off in the course of the next twenty years.

Sir NIGEL KINGSCOTE congratulated the Society upon this statement, and referred to the pleasure which it gave him of being Chairman of a Committee that was able to present so satisfactory a report. It could not be expected, however, that every year would be as successful as the last, and he therefore hoped that no members of the Society, whether on the Council or not, would relax their efforts to maintain the Society in its present position.

House.

Sir NIGEL KINGSCOTE (Chairman) presented a report from this Committee dealing with certain transfers of Harewood House Debenture Stock and other matters in connection with the Society's house.

Journal.

Sir JOHN THOROLD (Chairman), reported that directions had been given to the Editor as to the contents of the next number of the Journal, and that various suggestions for articles and notes in future numbers had been discussed. The next number of the Journal would contain, amongst other papers, an article by the Secretary on the old Board of Agriculture (1793-1822), with portraits of the Presidents and other illustrations (see page 1). The Com-

mittee recommended that the Society's thanks be given to Mr. John Thornton for his kind presentation to the Library of Porter's Tables for 1841-1852, and of other old official documents relating to agricultural statistics.

Chemical and Woburn.

Mr. WARREN reported that several communications had been received by the Society with reference to the land in Essex, which had been flooded by the recent incursion of the sea. Information derived from previous experience of flooded land in other parts of the country had been collected, and communicated to the members who had applied. The Society's Consulting Chemist was at present engaged in inquiring into the extent to which salt was present in the soil, and the rate at which it could be removed therefrom. Dr. Voelcker had also reported that "pot experiments" were already in progress at the Society's new pot culture station at Woburn under the Hills bequest; and other experiments were being made with the object of testing the supposed superiority of large-sized seeds in wheat and barley in preference to those of medium size, and also the comparative value of soft or starchy and hard or glutinous wheat and barley. It was proposed, also, to initiate experiments to discover the chemical agents most efficacious in the prevention of "finger-and-toe" in turnips.

Botanical and Zoological.

The PRESIDENT said that before he called for the Report of this Committee, he thought he should be carrying out the wish of the Council in expressing their great pleasure at seeing Mr. Whitehead once more amongst them. They had all deeply sympathised in the terrible affliction which the typhoid outbreak at Maidstone had brought upon him, and they were glad that his health was sufficiently restored to enable him to again give them the benefit of his valuable services.

Mr. WHITEHEAD expressed his thanks for the kind words which had been used by the President, in welcoming him back to his work for the Society. He was most deeply grateful for the kindness and consideration which had been extended to him by his Lordship and the Council, and which he should never forget.

Mr. WHITEHEAD then presented the recommendation of his Committee that himself and the Secretary should be appointed as the Society's representatives to attend the International Congress of Zoology to be held next August at Cambridge. The Consulting Chemist had reported the commencement at Woburn of "pot experiments" to test the relative results obtainable by sowing large or medium-sized seeds of wheat and barley, as suggested by the Committee at their last meeting.

The following report had been presented by the Society's Consulting Botanist:—

During the past month twenty-one applications have been dealt with. Evidence of more extended injury to clovers from the parasitic fungus (*Sclerotinia Trifoliorum*) have reached the Botanist, plants destroyed by the disease having been received from Kent, Sussex, Hertfordshire, Leicestershire, and Lincolnshire.

Another case of the failure of the wheat crop from the attack of the fungus that causes straw blight was investigated. The spring wheat of a specially early variety was sown on May 1 last year. The crop all over the field tillered very thickly, but never came to maturity, and what came into ear did not fill. The fungus attacked the lower joints of the wheat just after flowering, and it so destroyed these joints that the food for the filling of the grains could not be sent up the stem. The plants, being unable to ripen seed, retained possession of the ground, and though the wheat is an annual plant, its life is continued so that seed may be produced.

Complaints have been made of injury done to lambs by their eating the common weed *Alchemilla arvensis*. In a recent report this was referred to as a suspicious plant, and information was asked from those who had any experience of it in pastures. Though the *Alchemilla* in itself possesses no known injurious qualities, the use of it by lambs when they are beginning to eat green food is said to bring on scouring; this is followed by a strong tendency to rest and sleep, and death ensues. When the plant is eaten by sheep it forms but a small portion of the food they consume, and no injurious results follow.

A sample of hay on which a herd of Jerseys were being fed was analysed, with the view of determining whether it contained anything that might be the cause of abortion which had appeared in the herd. The grasses were not ergoted, and there was nothing present in the hay that would jus-

tify the supposition that it could in any way have caused the malady.

A small pond intended to be used as drinking water for stock became coloured with enormous numbers of a green cellular plant, called *Chlamydomonas pulvisculus*, and was feared to be unfit for its purposes. This is a common weed found in pools of fresh water everywhere, occurring even in water-butts. It is not harmful, and may disappear as suddenly as it appears.

(Signed) WILLIAM CARRUTHERS.

March 1, 1898.

Veterinary.

The Hon. CECIL PARKER (Chairman) presented, for publication in the next number of the Journal, the annual report of the Royal Veterinary College, on the investigations conducted at the College under the Society's annual grant of 500*l.* for the year 1897 (see page 118).

The Committee recommended the following addition to the Regulations of the stock prize-sheet, which was about to be reprinted, and they had instructed the Secretary to include a similar notice in the circular of instructions to exhibitors of live stock at the Birmingham Meeting: "All animals sent for exhibition will be inspected, on their arrival at the entrance to the Showyard, by the veterinary inspectors of the Society. The veterinary inspectors are authorised to refuse to permit any animal to be admitted into the Showyard if it be affected with contagious or infectious disease, or with any disease which in their opinion is likely to prove dangerous to other animals." The Committee recommended that Mr. Crutchley be added to their number.

The following report had been presented by Professor McFadyean:—

PLEURO-PNEUMONIA.—During the month of February no outbreak has been reported, but 117 animals have been slaughtered as having been exposed to infection, making a total of 22[illegible] animals so slaughtered in connection with the outbreaks which occurred in January.

ANTHRAX.—The number of outbreaks reported during the four weeks ended February 19, 1898, was 42, and the total number for the first eight weeks of the current year was [illegible], being an increase of 5 as compared with the corresponding period of 1897.

GLANDERS.—During the four weeks ended February 15 there were 72 outbreaks, making a total of 138 outbreaks for the first eight weeks of this year. This is an increase of 26 outbreaks as compared with the first eight weeks of 1897.

RABIES.—The returns for the first eight weeks of this year show a most gratifying decrease in the prevalence of rabies, the total number of cases for that period being 6, as against 34 cases in the corresponding period of 1897.

SWINE FEVER.—The recent returns show a serious recrudescence. The number of outbreaks reported during the last four weeks of 1897 was only 77, while for the first four weeks of this year the outbreaks number 135, and for the second four weeks 203. The outbreaks in February have occurred in 36 counties.

MISCELLANEOUS.—During the month of February cases of the following diseases have been referred to the research laboratory at the Royal Veterinary College for examination:—Anthrax (in cattle and pigs), tuberculosis (in the horse, ox, pig, and cat), gastro-enteritis (in the horse, ox, pig, and sheep), mange (in foxes), &c. A cow has been purchased for use in connection with the inquiry into abortion, but no case of abortion has recently been reported to the laboratory, and the intended experiment has therefore had to be postponed. During the month of February two cows and two calves suffering from parasitic gastritis were admitted to the Royal Veterinary College Infirmary for experimental treatment.

Stock Prizes.

Mr. SANDAY (Chairman) reported that a letter had been received from the National Sheep Breeders' Association drawing the attention of the Society to the increase of the entry fees. The Committee recommended that the Association be referred to paragraphs 11 and 15 of the last Report of the Council to the General Meeting of members on December 9, 1897 (vol. viii. pp. 715 and 716), as explaining the reasons why the Council had decided to increase the entry fees for live stock at the country meetings. A question having been raised as to the breed of ponies comprised in the term "mountain ponies," the Committee recommended that the heading of Classes 38 and 39 of the Birmingham prize-sheet be altered to read: "Mountain and Moorland Ponies, including Dartmoor, Exmoor, New Forest, Shetland and Welsh breeds," and that this alteration be made in the second edition of the prize-sheet, which it was proposed to issue immediately.

Mr. SANDAY gave notice that at the next meeting of the Council, he proposed to move for a grant of 5,000*l.* for prizes for live stock, poultry, produce, &c., at the Maidstone Meeting of 1899.

Judges' Selection.

Mr. SANDAY (Chairman) reported that, with very few exceptions, the gentlemen who had been invited to act as Judges at the Birmingham Meeting had accepted the Society's invitations, and the necessary arrangements had been made for the completion of the list forthwith, and for its publication in the forthcoming number of the Journal to be issued on the 31st instant (see p. xxxv).

Implement.

Mr. FRANKISH (Chairman) reported that the Committee recommended the appointment of a Sub-Committee, consisting of the Chairman, the Honorary Director, and the Stewards of Implements, to examine and allot the various stands in the implement yard at the Birmingham Meeting, and the first meeting of the Committee was appointed to be held at 10 a.m. on Monday, April 4 next. Various questions arising out of the entries for the forthcoming Birmingham Meeting had been discussed and settled, and the Committee proposed at their next meeting to bring up a formal motion for the adoption of the regulations for the trials of hop-washing machines at the Maidstone Meeting of 1899.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the whole of the plant and buildings required for the Birmingham Meeting had been removed from Maidstone to Four Oaks Park, Sutton Coldfield. The Superintendent's office and the railway offices were nearly completed. The timber yard was fenced in, and the hoarding round the Showyard was being proceeded with. The Local Committee were still engaged in levelling the site of the Showyard, and had commenced to deliver railway sleepers for making roads up to the entrances. Questions relating to the arrangements for refreshments in the Showyard and the fruit-drying and table poultry demonstrations had been discussed and settled.

Education.

Lord MORETON (Chairman) presented the Committee's recommendations as to the appointment of Examiners for the Society's Examinations in Agriculture from May 10 to 14 next, and in Dairying from September 26 to 30 next.

Dairy.

Mr. CRUTCHLEY (Chairman) reported that the plan of the dairy had been approved, and that other matters of detail connected with the dairy had been settled.

Country Meetings of 1900 and 1901.

Sir JOHN THOROLD (Chairman) reported that the Committee of Selection had had under consideration at their meeting held the previous day an invitation from Cardiff for the Society's Country Meeting of 1900; but he understood that a subsequent letter had since been received which it might be well that the Secretary should read.

The SECRETARY said there had been previous correspondence with the Town Clerk of Cardiff on the subject in the year 1895, when the Town Council had sent an invitation to the Society to hold its Meeting at Cardiff in the year 1900; and this invitation had been repeated in a letter addressed by the Town Clerk to the Society on January 26 last. It had been pointed out to the Town Clerk that in consequence of the epidemic of typhoid fever at Maidstone the visit of the Society to District D (the South of England) had had of necessity to be postponed until 1899, and this had involved also the postponement of the Society's visit to District E (Yorkshire) from 1899 to 1900, and of District F (which includes South Wales) from 1900 to 1901. The Town Clerk had been informed that the Council would be in a better position to consider the obliging invitation which the Corporation had now repeated, if they could understand that such an invitation could be regarded as applicable either to 1900 or 1901, as circumstances—which could not at present be forecast—might indicate to be desirable. In a letter received that morning, the Town Clerk had intimated that the Corporation would

much prefer the Meeting to be held at Cardiff in 1900, but that if the Council of the Society should be of opinion that 1901 would be preferable, the Corporation would readily acquiesce in this decision.

In the discussion which ensued, the Earl of FEVERSHAM urged the claims of Yorkshire to a visit from the Society in the year 1900, and said that he had no doubt that if the Society's intentions were more generally known, there would be no lack of invitations from towns in that county.

The PRESIDENT said the turn of Yorkshire came in 1900, and of course they would be very ready to receive any invitation that came from that county. He would point out that on December 9 last the Council reported to the General Meeting that, in view of the postponement of the Maidstone Meeting till 1899, the Society's Country Meeting would, in accordance with the usual scheme of rotation of districts, be held in District E (consisting of the County of York) in the year 1900 instead of 1899. That was a formal announcement of which it would be well that towns in Yorkshire should take notice.

Sir JACOB WILSON thought that it would be very desirable not to depart from the principle of the rotation of districts laid down by the Society since its commencement, and that they ought to adhere to the scheme of the rotation of districts as settled in 1892, under which District E (Yorkshire) would be visited in 1900, and District F (which included South Wales) in 1901.

After some further discussion, in which the Hon. CECIL PARKER, Sir NIGEL KINGSCOTE, Colonel CURTIS-HAYWARD, Mr. SUTTON, Mr. STANYFORTH, and others took part, it was agreed that it was impossible for the Council to give at that moment any definite reply to the invitation from Cardiff. The district in which the Country Meeting was to be held in a given year was not usually "declared" until the Annual General Meeting held on May 22 two years before; but should it be definitely announced at the General Meeting convened for next May that the Society's Country Meeting of 1900 would be held at some particular town in Yorkshire, the district in which the Country Meeting of 1901 would be held might be "declared" at the same General Meeting. As there was no present reason to doubt that this would be District F, the invitation from Cardiff could then be considered. Meanwhile the sincere thanks of the Council for the invitation were ordered to be sent.

Miscellaneous.

On the motion of the PRESIDENT the Society's seal was ordered to be affixed to three new certificates of Harewood House Debenture Stock.

Date of Next Meeting.

The Council then adjourned until Wednesday, April 6 next, at noon.

BIRMINGHAM MEETING, 1898: CLOSING OF ENTRIES.

Exhibitors are reminded that the *final dates* for the receipt of *Entries* for the Birmingham Meeting will be as under:—

LIVE STOCK (Horses, Cattle, Sheep, Pigs):—

FRIDAY, APRIL 15, 1898, at 10s. per Entry.
Saturday, April 30, at 15s. per Post Entry.
Saturday, May 14 (last day), at £1 per Late Entry.

POULTRY AND FARM PRODUCE:—

Saturday, April 30, 1898, at 2s 6d. per Entry.
Saturday, May 14 (last day), at 5s. per Post Entry.

Double Fees throughout to Non-Members of the Society.

LIST OF JUDGES

IN THE SEVERAL CLASSES AT THE

BIRMINGHAM MEETING, JUNE 18 TO 24, 1898

IMPLEMENTS.

Self-moving Vehicles.

Classes I. & II.

Sir WILLIAM ANDERSON, K.C.B., F.R.S., Lesney House, Erith, Kent.
BRYAN DONKIN, C. E, Southwark Park Road, Bermondsey, S.E.
F. W. WEBB, C.E., Crewe.

Miscellaneous Implements (*Entered for Silver Medals*) and **Methods of Safeguarding Chaff-Cutters.**—*Class* III.

R. M. GREAVES, Wern, Tremadoc, Carnarvon.
BAYNTON HIPPESLEY, Ston Easton Park, Bath.

HORSES.

Hunters.—*Classes* 1, 3, 4, & 7–10.

Lord RATHDONNELL, Drumcar, Dunleer, co. Louth.
OWEN C. WALLIS, Crackshill Lodge, Kilsby, Rugby.

Hunters.—*Classes* 2, 5, 6, & 11–13.

DIGBY COLLINS, Inwood, Henstridge, Blandford.
T. H. HUTCHINSON, The Manor House, Catterick, Yorks.

Cleveland Bays and Coach Horses.

Classes 14–21.

JOHN WHITE, The Grange, Appleton Roebuck, Bolton Percy.
GEORGE C. WHITWELL, Eaglescliffe, Yarm-on-Tees.

Hackneys.—*Classes* 22–32.

JOHN MAJOR, Sledmere Grange, York.
JOSEPH MORTON, Stow, Downham Market, Norfolk.

Ponies, Mountain & Moorland Ponies, Harness Horses and Ponies.

Classes 33–39 & 50–52.

JOHN HILL, Felhampton Court, Church Stretton, Salop.
TOM MITCHELL, The Park, Eccleshill, near Bradford.

Polo Ponies.—*Classes* 40–49.

Capt. D. ST. G. DALY, Heythrop, Chipping Norton, Oxon.
Sir RICHARD D. GREEN-PRICE, Bart., The Poplars, Kingsland, Shrewsbury.

Shires and Draught Horses.

Classes 53–62 & 75–78.

Capt. HEATON, Worsley, Manchester.
CHARLES W. TINDALL, Wainfleet, Lincolnshire.

Clydesdales.—*Classes* 63–68.

JAMES ALSTON, Crosslee, Stow, Midlothian.
JAMES WEIR, Sandilands, Lanark, N.B.

Suffolks.—*Classes* 69–74.

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H. SHOWELL, Home Farm, Hasketon, Woodbridge, Suffolk.

CATTLE.

Shorthorns.—*Classes* 79–85.

GEORGE JOHN BELL, Standingstone, Wigton, Cumberland.
JAMES HOW, Broughton, Huntingdon.

Herefords.—*Classes* 86–92.

THOMAS FENN, Estate Offices, Downton Castle, Ludlow, Salop.
AARON ROGERS, The Rodd, Presteign, Radnorshire.

Devons and Sussex.—*Classes* 93–103.

SAMUEL KIDNER, Bickley, Milverton, Somerset.
ALFRED STANFORD, Eatons, Steyning, Sussex.

Longhorns.—*Classes* 104–106.

(*Not yet appointed.*)

Welsh.—*Classes* 107–111.

O. H. FOULKES, Bodrwyn, Llangefni, Anglesey.
JOHN ROBERTS, Well House, Chester.

Red-Polled and Aberdeen Angus.

Classes 112–121.

GEORGE J. WALKER, Portlethen, Aberdeen.
CHARLES WATERS, The Grange, Postwick, Norwich.

Galloways and Ayrshires.

Classes 122–131.

ROBERT MONTGOMERIE, Lessnessock, Ochiltree, N.B.
ROBERT SHENNAN, Balig, Kircudbright, N.B.

Jerseys.—*Classes* 132–136.

W. ASHCROFT, 13 The Waldrons, Croydon, Surrey.
ERNEST MATHEWS, Chequers Mead, Potter's Bar.

Guernseys.—*Classes* 137–141.

ANDREW DUNLOP, Church Farm, Hendon, Middlesex.
CHRISTOPHER MIDDLETON, Marton R.S.O., Yorkshire.

Kerries and Dexters.—*Classes* 142–145.

H. D. BETTERIDGE, Drayton House, Drayton St. Leonard's, Wallingford, Berks.
F. N. WEBB, Babraham, Cambridge.

Dairy Cattle.—*Class* 149.

THOMAS CATTELL, Erdington, Birmingham.
RICHARD HENSHAW, Tythby Grange, Bingham, Notts.

SHEEP.

Leicesters.—*Classes* 150–154.

BENJAMIN PAINTER, Burley-on-the Hill, Oakham, Rutland.
JAMES J. STAMPER, Highfield House, Nunnington, York.

Cotswolds.—*Classes* 155–159.

THOMAS BROWN, Marham Hall, Downham Market.
J. J. GODWIN, Troy, Somerton, Banbury.

Lincolns.—*Classes* 160–165.

CHARLES CLARKE, Bayard's Leap, Sleaford.
JONAS WEBB, Melton Ross, Barnetby Junction, Lincoln.

Oxford Downs.—*Classes* 166–170.

A. F. MILTON DRUCE, Bladon, Woodstock, Oxon.
HENRY OVERMAN, Kipton House, Weasenham, Swaffham, Norfolk.

Shropshires. (Rams.)

Classes 171–174.

CHARLES COXON, Elford Park, Tamworth.
MATTHEW WILLIAMS, Whiston Grange, Albrighton, Wolverhampton.

Shropshires. (Ewes.)

Classes 175–177.

J. E. FARMER, Felton, Ludlow.
A. E. MANSELL, Harrington Hall, Shifnal.

Southdowns.—*Classes* 178–182.

ALLAN COOPER, Norton, Bishopstone, Lewes.
GEORGE JONAS, Old Vicarage, Duxford, Cambridge.

Hampshire Downs.—*Classes* 183–187.

J. CARPENTER, Manor House, Burcombe, Salisbury.
WILLIAM NEWTON, Crowmarsh Battle, Wallingford, Berks.

Suffolks.—*Classes* 188–192.

D. A. GREEN, Junior, Fingringhoe Hall, Colchester.
J. R. GRIMSEY, St. Helena, Dunwich, Saxmundham.

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JOHN H. LAURIE, Hardens, Duns, N.B.
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Somerset and Dorset Horned.

Classes 198 & 199.

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Classes 200 & 201.

H M. COBB, Higham, Rochester.
ARTHUR FINN, Westbroke, Lydd, Kent.

Wensleydales.—*Classes* 202 & 203.

JAMES PICKARD, Thoresby, Aysgarth, Yorks.
MATTHEW WOOD, Ellington House, Ellington, Masham R.S.O.

Cheviots.—*Classes* 204 & 205.

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THOMAS O. THORNTON, Hyndlee, Hawick, N.B.

Black-faced Mountain.
Classes 206 *&* 207.

J. K. BORLAND, North Balloch, Girvan, N.B.

HENRY WALTON, How Burn, Alston, Carlisle.

Lonks & Herdwicks.—*Classes* 208–211.

WILLIAM ABBOTT, Beckstones, Thornthwaite, Keswick.

J. M. GREEN, Steeton, near Keighley.

Welsh Mountain.—*Classes* 212 *&* 213.

WILLIAM DAVIES, Llysfasi, near Ruthin.

OWEN PRICE, Nantyrharn, Cray R.S.O, Brecon.

PIGS.

Whites.—*Classes* 214–225.

JOHN BARRON, Elvaston Nurseries, Borrowash, Derby.

A. F. NICHOL, Bradford, Belford, Northumberland.

Berkshires.—*Classes* 226–229.

W. A. BARNES, Hasluck's Green Farm, Shirley, Birmingham.

EDWARD BURBIDGE, South Wraxhall, Bradford-on-Avon.

Tamworths.—*Classes* 230–234.

J. R. RANDELL, Rock House, Yatton, Somerset.

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POULTRY.
Classes 235–326.

ALFRED ASHTON, Kermincham Lodge, Holmes Chapel, Crewe.

HERBERT ATKINSON, Ewelme, Wallingford, Berks.

EDWARD BROWN, F.L.S., Velmead, Caversham, Reading.

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PRODUCE.

Butter and Cream Cheese.
Classes 327–330; 335 *&* 336.

Miss M. M. MACQUEEN, County Council Farm, Hutton, Preston.

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Cheese.—*Classes* 331–334.

JOHN BENSON, Midland Dairy Institute, Kingston Fields, Derby.

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Cider and Perry.—*Classes* 337–340.

JOHN WATKINS, Pomona Farm, Withington, near Hereford.

Hives and Honey.—*Classes* 341–361.

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HENRY JONAS, Portley Wood, Whyteleafe, Surrey.

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Statistical Abstract for the Several Colonial and other Possessions of the United Kingdon, 1882–96. 8vo. London, 1897...........*Board of Trade*
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—— The Progress of the nation. New edit. 8vo. London, 1851...*Purchased*
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QUARTERLY Journal of Agric. 16 pts. 8vo. Edin. 1829–36...*Mr. A. B. Biddell*
Quintinye, [Jean] de la, The complete gardner. 3rd edit. Translated by G. London and H. Wise. 8vo. London, 1701.......................*Purchased*
RANDALL, J., The Semi-Virgilian Husbandry. 8vo. Lond., 1764...*Purchased*
Ribbentrop, B., Review of the Forest Administration in British India for 1895–6. Fol. Calcutta, 1897 ....*Office of Govt. Printing, Calcutta*
Rousseau, J. J., Letters on the Elements of Botany, Translated by Martyn. 8vo. London, 1787. Another edit., 1807. .... *Purchased*
SAARE, O., Fabrikation der Kartoffelstärke. 8vo. Berlin, 1897 ...*Purchased*
Salas, Carlos P., L'agriculture...dans la province [de Buenos Aires] en 1895. 8vo. La Plata, 1897...*Author*
Schulze, C., Die Benutzung des Obstes. 8vo. Leipzig. n. d. ......*Purchased*
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Sharrock, R., The Propagation of Vegetables. sm. 8vo. Oxford, 1672...*Purchased*
Sidney, S., Book of the Horse, ed. Sinclair and Blew. 4to. Lond., 1893...*Purchased*
Smith, John, LL.B., Chronicon Rusticum-Commerciale, or Memoirs of Wool. 2 vols. 8vo. London, 1747 ....*Prof. H. S. Foxwell*
Smith (John B.), Economic entomology. 8vo. Philadelphia, 1896...*Purchased*
Smith, Worthington G., Diseases of Field and Garden Crops. sm. 8vo. London, 1884...*Purchased*
Somerville, W., Farm and Garden insects. 12mo. London, 1897 ......*Author*
Somerville, John, Lord, System followed by the Board of Agriculture illustrated. 4to. London, 1800 ....*Purchased*
Spencer, Sanders, Pigs: Breeds and Management. 8vo. Lond., 1897...*Purchased*
[Stabler, Edward] Overlooked pages of Reaper History. [A reprint of three scarce American tracts, date c. 1854, on the reaping machine.] 8vo. Chicago, 1897 ....*Mr. John F. Steward*

Stud-Books :—
General Stud-Book. Vol. XVIII. 8vo. London, 1897 ....*Purchased*
Hackney Stud-Book. Vol. XIV. 8vo. London, 1897 ....*Society*
Hunters' Improvement Society, Record of Mares and Sires; Vol. VII. 8vo. London, 1896 ....*Society*
Shire Horse Stud-Book. Vol. XVIII. 8vo. London, 1897 ....*Society*
Stambog over Heste af Lettere Race. Af Ludv. v. Oppermann. 8vo. Kjobenhavn, 1897 ....*Mr. Harald Faber*
Suffolk Stud-Book; ed. Fred Smith; Vol. XI. 4to. Diss, 1898......*Society*

Switzer, Stephen, Ichnographia rustica: 2 vols. 8vo. Lond., 1718...*Purchased*
—— The practical Fruit Gardener. 8vo. Lond., 1731 ....*Purchased*
—— The Practical Husbandman and Planter. 2 vols. 8vo. London, 1733–4........... ....*Purchased*

Sz., Frau von, Die Conserven von Früchten und Pflanzenstoffen. 8vo. Berlin, n.d. .... *Purchased*
TATHAM, William, National Irrigation. 8vo. London, 1801 ......*Purchased*
Thaer, Dr. A., Die Alt-ägyptische Landwirthschaft. 8vo. Berlin, 1881...*Purchased*
—— System der Landwirtschaft. 2te Auflage. 8vo. Berlin, 1896...*Purchased*
Thoms, Prof. Dr. G., Wie ist der hohe Gehalt an Eisen resp. Eisenoxyd in der Asche von Trapa natans zu erklären. 8vo. Berlin, 1897 ...*Author*
—— Das Jubiläum des Herrn Prof. Thoms. 4to. n.p., n. d..........*Prof. Thoms*
—— Die Ergebnisse der Dünger-Kontrole. xx. 8vo. Riga, 1897 ......*Author*
Thomson, R. D., Researches on food of animals. 8vo. Lond., 1846...*Purchased*
Thornton, James H., Memories of Seven Campaigns. 8vo. London, 1895...*Author*
Thorold Rogers, James E., The Industrial and Commercial History of England. 2 vols. 8vo. London, 1891..............................*Purchased*
Timm, H., Obst- und Gemüseverwertung. 8vo. Stuttgart, 1892 ...*Purchased*
Tipper, C. J. R., The Rothamsted Experiments, and their practical lessons for farmers. 8vo. London, 1897 ....*Publishers*
Traill, H. D., Social England; Vol. VI. (1815–85). 8vo. Lond., 1897...*Purchased*
Traité des prairies artificielles. 4to. Paris, 1778 ....*Purchased*
[Tull, Jethro] New Horse Houghing Husbandry. 8vo. Dublin, 1731...*Purchased*
T[ull], I[ethro], The Horse Hoing Husbandry. Fol. London, 1733...*Purchased*
Tusser, Thomas, A hundreth good pointes of Husbandrie. sm. 4to. London, 1810 ....*Purchased*
VAUX, Thomas, A new plan for tilling land. 8vo. London, 1840 ...*Purchased*
Vernet, José Cilley, Los cereales y oleaginosos trillados en la provincia de Buenos Aires en la cosecha de 1895–6. 8vo. La Plata, 1896 ....*Author*
Virgil, Pub. Virgilii Maronis Georgicorum libri quatuor; ed. John Martyn. 4to. London, 1741 ....*Purchased*
—— Pub. Virgilii Maronis Bucolicorum eclogæ decem; ed. John Martyn. 4to. London, 1749.......... ....*Purchased*
Vuyst, Paul de, Manuel des cultures spéciales. 8vo. Paris, 1897 ......*Author*
WALLACE, Robert, The Farming of Cape Colony. 8vo. London, 1896...*Purchased*
—— Agriculture of Australia and New Zealand. 8vo. Lond., 1891...*Purchased*
Watts, F., and Shepherd, F. R., Antigua, Report of Results on Experiment Fields. Fol. Antigua, 1896.. *Presented*
Williams, E. E., The Foreigner in the Farmyard. 8vo. Lond., 1897...*Publishers*
Wilson, J. M., Rural Cyclopedia. 4 vols. la. 8vo. Edin., 1855 ...*Purchased*
Wing, Henry H., Milk and its Products. 8vo. New York, 1897 ...*Purchased*
Woll, F. W., Handbook for Farmers and Dairymen. 8vo. New York and London, 1897...*Author*
Wolff, H. W., People's Banks. 8vo. London, 1896 .... *Purchased*
Wright, Joseph, The English Dialect Dictionary; Parts III. and IV. 4to. London, 1897..*Purchased*
YOUNG, ARTHUR, Rural Œconomy. 8vo. Dublin, 1770...............*Purchased*
—— The Farmer's Calendar. 10th ed. 8vo. Lond., 1815 ....*Purchased*
Young, D., National Improvements upon Agriculture. 8vo. Edin., 1875.*Purchased*

The Society is indebted to numerous Government Departments, both at home and abroad, to Boards of Agriculture, Agricultural Societies, and kindred institutions, for copies of their Annual Reports, Journals, Proceedings, Transactions, Bulletins, and other documents received regularly for the Library in exchange for copies of the Journal, as well as to the Editors of many agricultural and general papers for the current numbers of their publications, which have been placed for reference in the Reading Room.

PICTURES, &c., ACQUIRED BY THE SOCIETY IN 1897.

COLOURED ENGRAVING OF "THE LINCOLNSHIRE OX." Engraved by G. T. Stubbs, from painting by G. Stubbs. Published January 20, 1798.
Presented by Mr. James E. Ransome
COLOURED ENGRAVING OF HANOVER SQUARE. Drawn by E. Dayes. Engraved by R. Pollard and F. Jukes. 1787 ....*Purchased*

MEMORANDA.

ADDRESS OF LETTERS.—All letters on the general business of the Society should be addressed to the Secretary, at 13 Hanover Square, London, W.

TELEGRAMS.—The Society's registered address for telegrams is "Practice, London." *Replies by Telegraph cannot be sent unless paid for in advance, and cannot be guaranteed in any case.*

TELEPHONE NUMBER, 3675, "Gerrard."

OFFICE HOURS.—10 to 4. On Saturdays, 10 to 2.

GENERAL MEETINGS in London: Monday, May 23, 1898, and Thursday, December 8, 1898, at noon, at the Society's house, 13 Hanover Square, W.

MONTHLY COUNCIL (for transaction of business), at noon on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

ADJOURNMENTS.—The Council adjourn over Passion and Easter weeks, when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

SUBSCRIPTIONS.—1. *Annual.*—The subscription of a Governor is £5, and that of a Member £1 due in advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st of June.

2. *For Life.*—Governors may compound for their subscriptions for future years by paying on election, or at any time thereafter, the sum of £50, and Members by paying £15. Members elected before 1890 may compound at any time on payment of £10 in one sum; and Members elected in or subsequently to 1890 may compound for the same amount after the payment of ten annual subscriptions. Governors and Members who have paid their annual subscription for 20 years or upwards, and whose payments are not in arrear, may compound for future annual subscriptions, that of the current year inclusive, by a single payment of £25 for a Governor, and £5 for a Member. No Governor or Member can be allowed to enter into composition for life until all subscriptions due by him at the time shall have been paid.

No Governor or Member in arrear of his subscription is entitled to any of the privileges of the Society.

All Members belonging to the Society are, under the Bye-laws, bound to pay their annual subscriptions until they shall withdraw from it by notice in writing to the Secretary.

PAYMENTS.—Subscriptions may be paid to the Secretary, either at the office of the Society, No. 13 Hanover Square, London, W., or by means of crossed cheques in favour of the Secretary, or by postal orders, to be obtained at any of the principal post-offices throughout the kingdom, and made payable at the Vere Street Office, London, W. When making remittances it should be stated by whom, and on whose account, they are sent. All Cheques and Postal Orders should be crossed "London and Westminster Bank, St. James's Square Branch."

On application to the Secretary, forms may be obtained for authorising the regular payment, by the bankers of individual members, of each annual subscription as it falls due. Members are particularly invited to avail themselves of these Bankers' orders, in order to save trouble both to themselves and to the Society. When payment is made to the London and Westminster Bank, as the Bankers of the Society, it will be desirable that the Secretary should be advised by letter of such payment, in order that the entry in the bankers' book may be at once identified, and the amount posted to the credit of the proper person. No coin can be remitted by post, unless the letter be registered.

JOURNAL.—The Parts of the Society's Journal are (when the subscription is not in arrear) forwarded by post to Members, or delivered from the Society's Office to Members or to the bearer of their written order.

The back numbers of the Journal are kept constantly on sale by the publisher, Mr. JOHN MURRAY, 50A Albemarle Street, W.

NEW MEMBERS.—Every candidate for admission into the Society must be nominated by a Governor or Member, and must duly fill up and sign an application for Membership on the appointed form. Forms of Proposal may be obtained on application to the Secretary. The Secretary will inform new Members of their election by letter.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, APRIL 6, 1898.

EARL SPENCER, K.G. (PRESIDENT), IN THE CHAIR.

Present:

Trustees.—Sir Walter Gilbey, Bart. Colonel Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart.

Vice-Presidents.—The Earl of Feversham, the Earl of Ravensworth, Sir John Thorold, Bart., Mr. Charles Whitehead.

Other Members of Council.—Mr. George Blake, Mr. J. Bowen-Jones, the Earl of Coventry, Lieut.-Col. J. F. Curtis-Hayward, Mr. A. E. W. Darby, Mr. J. Marshall Dugdale, Mr. W. Frankish, the Marquis of Granby, the Earl of Jersey, G.C.M.G., Capt. W. S. B. Levett, Mr. C. S. Mainwaring, Mr. Henry D. Marshall, Mr. Joseph Martin, Mr. T. H. Miller, the Hon. Cecil T. Parker, Mr. Albert Pell, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. C. C. Rogers, Mr. S. Rowlandson, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. E. V. V. Wheeler, Mr. J. C. Williams, Sir Jacob Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. Cecil Warburton, Zoologist.

Professor Sir George Brown, C.B.; Professor McFadyean.

Mr. W. H. Lythall, Secretary of the Birmingham Local Committee.

Apologies for non-attendance were received from the Earl of Derby, K.G., Lord Brougham and Vaux, Lord Moreton, Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. H. Chandos-Pole-Gell, Mr. F. S. W. Cornwallis, M.P., Mr. James Hornsby, Mr. P. A. Muntz, M.P., Mr. A. E. Pease, M.P., Mr. Dan. Pidgeon, Mr. J. P. Terry, Mr. R. A. Warren, Mr. C. W. Wilson, and Professor J. B. Simonds.

Election of New Members.

The minutes of the last monthly meeting of the Council, held on March 2, 1898, having been taken as read and approved, the election of the following fifty-one members was proceeded with:—

Members.

ADAMSON, W. S...Careston Castle, Brechin.
BEAVAN, D. .Lower Sandlin, Leigh, Malvern.
BLYTH, E. L. Ireland...Plestowes, Warwick.
BRIDGE, H. G...Morland Ho., nr. Stockport.
BRINKWORTH, G. E...119 High St., Winchester.
BROWN, R...Failand, nr. Bristol.
CHALMERS, T...Church Lawford, Rugby.
CLARK, T. Colbatch...Lawtonshope, Canon-Pyon, Hereford.
COOPER, R. A...Ashlyn's Hall, Berkhamstead.
CROCKFORD, E. B...Lyndale, Sutton Coldfield.
CROCKFORD, H. L...Sutton Coldfield.
CROSS, J. L...Mortfield, Bolton.
DAVIES, C. W. T...Church St., Wye, Kent.
DORLIN, C. W...Bromley Road, Colchester.
DREW, C. F. M...Drewscourt, Charleville, co. Cork.
FIELD, John B...Hill Top, W. Bromwich.
GROVE, H. C...Wylde Green, Birmingham.
GROVE, Mrs. H. C...Wylde Green, Birmingham.
HALL, L. J...Morland House, nr. Stockport.
HAYWOOD, J. W...Wetmoor Hall, Burton-on-Trent.
HENRIQUES, Major E. N., R.A...Sutton, Surrey.
*HOLLIDAY, J...1 Lismore Ter., Carlisle.
HOLM, C. H...Cairnbank, Duns, N.B.
HOWL, Oliver..Tipton, Staffs.

* Reinstated under Bye-law 12.

LANE, A. G. . Bodymoor Heath, nr. Birmingham.
LEIGH, A. . Hillcrest, Evesham
LOWE, G . . 2 Wellington Ter., Sutton Coldfield
LOXTON, C. A. . Shoal Hill Ho, Cannock.
MANSFIELD, E. . . Heathfield Ho, Whitby, Ches.
MARCUS, M. . . High Trees, Redhill
MATTHEWS, J. P. East Shaftoe, Capheaton.
MILTON, T. E. . . 13 Oozell's St N., Birmingham.
NETTLEFOLD, A. . . Grinkle, Loftus, Yorks.
NEWMAN, S. A. G. . . Littleton Place, Walsall.
OATES, W. . . Horley Green, Halifax.
OLIVER, W. . . Minety, Malmesbury.
PEARCE, E W. . . Wood Pk. Farm, Polesworth.
PETERS, L. Byron . . Fortune's Farm, Watford.
SANKEY, John . . Gravelly Hill, Birmingham.
SNUSHALL, E. . . 26 Oxford St., Birmingham.
STEVENSON, A. . . 4 Chapel Walks, Manchester.
TAILBY, M. C. . . Vicarage Road, Edgbaston.
TAYLOR, Miss B. . . Wylde Green, Birmingham.
TAYLOR, C. E. . . Akay, Sedbergh.
WARD, C . . Queen's Head, Epworth.
WARNER, J. . . 97 Queen Victoria St, E.C.
WHITMORE, F. H. D. C. . . Orsett Hall, Grays.
WILKES, J. S. . . Chaseley, Sutton Coldfield.
WILSON, T F. . . Haggis Farm, Barton, Cambs.
WILTSHIRE, J. . . Tupsley, Hereford.
WORRALL, J. . . Bradley Farm, Kinlet, Bewdley.

On the motion of Sir NIGEL KINGSCOTE, it was resolved: "That the Secretary be authorised to receive nominations of new members, and to admit them to the privileges of membership for the Birmingham Meeting, on condition that they sign the usual contract and pay their subscription for the current year."

The reports of the various Standing Committees were then presented and adopted as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the month ended March 31, 1898, as certified by the Society's Accountants, showed total receipts amounting to 7,319*l.* 0*s.* 5*d.*, and expenditure amounting to 5,631*l.* 5*s.* 6*d.* Accounts, amounting in all to 3,352*l.* 6*s.* 3*d.*, had been passed, and were recommended for payment. The quarterly statement of subscriptions, arrears, and property, as at March 31, 1898, had been laid upon the table.

House.

Sir NIGEL KINGSCOTE (Chairman) reported the Committee's recommendation that the Society's thanks be sent to Earl Carrington for his presentation of a print of his ancestor, the first Lord Carrington, President of the old Board of Agriculture from 1800 to 1803. Various accounts had been passed for payment, and arrangements had been made for the repainting of the outside of the Society's house.

Journal.

Sir JOHN THOROLD (Chairman) reported that copies of the Society's Journal, published on March 31, 1898, were now in course of distribution to the members. The Society was indebted to Sir John Lawes and Sir Henry Gilbert for their valuable contribution to this number of the Journal on "The Valuation of the Manures obtained by the consumption of Foods for the production of Milk." In answer to the circular to Governors, giving them the option of receiving their library copies of the Journal at the end of each year in a complete bound volume instead of in paper covers, about 100 Governors (or half of the total number) had accepted the offer.

Chemical and Woburn.

Mr. PELL reported that various accounts relating to the experiments under the Hills' Trust had been passed and referred to the Finance Committee for payment. A letter had been received from the British Association for the Advancement of Science asking the opinion of the Society "as to the desirability of the creation by the Government of a Central Agricultural Institution for the purpose of undertaking agricultural research;" and the Committee had passed the following resolution: "That this Committee regret that they do not consider it desirable that the Government should be urged to create a Central Agricultural Institution for the purpose of undertaking agricultural research." The Consulting Chemist had reported his inspection of two considerable tracts of country in Essex, which had recently been flooded by the sea, and he had drawn up a detailed plan of treatment, which was being carried out.

The Committee had received the following report from Dr. Voelcker, dealing with various cases of misleading statements and new forms of adulteration, which they recommended for publication with the proceedings of

Council. They were of opinion that such reports were most useful, and they had instructed Dr. Voelcker to submit similar reports at future monthly meetings of the Committee:

Basic Slag.—Several further cases have occurred in which basic slag of a quality inferior to that guaranteed has been supplied to members. In one instance, where the guarantee was 18 to 20 per cent. of phosphoric acid and 80 to 90 per cent. "fineness," the sample only gave 15·87 per cent. of phosphoric acid. A considerable allowance was made. In other cases, deficiencies of 1 per cent., 3½, and 4 per cent. of phosphates were severally noted.

Common Slag.—While basic slag has increased greatly in favour and has been found very useful, especially on heavy land pasture, it has been found more than ever desirable to impress upon purchasers the necessity of asking for and receiving "basic slag," inasmuch as other materials of very different character and manurial value have been sold under the name of "slag," the purchasers in many cases thinking that they were buying basic slag.

Steamed Bone Flour.—Attention is drawn to the fact that under this name is now being offered a finely-ground material which is not ordinary steamed bone ground, but is derived from bone which has been treated with sulphurous acid for the purpose of obtaining less deeply-coloured glue and size than are produced in the ordinary process. As a consequence of this treatment the material contains a variable but considerable amount of sulphate of lime, and, on being brought in contact with acids, sulphurous acid gas is readily liberated, and may be recognised by its stifling nature. If a farmer without knowledge of what this material is, and thinking it to be the ordinary steamed bone flour of commerce, were to mix it with certain manures and put it on his land, evolution of sulphurous acid and injury to his crop might quite well arise. Such a material ought not to be sold under the name "steamed bone flour," but under some distinctive title, clearly setting out its method of preparation.

Calcined Leather Powders.—Under this name a member of the Society sent for analysis a material offered to him as a source of ammonia for hops. The price was to be 8*s.* 6*d.* per unit of ammonia. It was found by analysis that 80·6 per cent. of the material was insoluble in boiling water, and there was only 0·12 per cent. of nitrogen in a soluble and available condition.

Bone Meal.—A sample was sent for analysis of what was stated to be "Pure English bones, neither steamed nor boiled." Ten tons had been purchased, at 4*l.* 10*s.* per ton delivered. The first delivery was of 2 tons only, and the purchaser sent a sample of this for analysis. It gave:—

Phosphate of lime .	58·13 per cent.
Ammonia . . .	1·70 per cent.

and was clearly "steamed bone" and not "bone meal." On the purchaser complaining, the vendor wrote, "the bones are steamed to extract the fatty matter." It is clear from the analysis that a good deal besides the fatty matter has been extracted, as pure bone meal should contain 4½ to 5 per cent. of ammonia. This view of the case seemed also to strike the purchaser, who paid for the 2 tons he had had, and left the remainder on the vendor's hands.

Peruvian Guano.—Considerable sales of Peruvian guano of a phosphoric character principally (and containing 50 to 60 per cent. of phosphate of lime and 2 per cent. of ammonia) have been made of late, chiefly for root crops and hops, and generally as a substitute for superphosphate. The prices have been very low. It is well to point out, however, that care must be taken to have the true "official analysis" guaranteed, for not unfrequently analyses are put forward as being those of particular cargoes, but which are materially higher than the true "official analyses" of those shipments. Unless the analyses are guaranteed, reliance must not be put upon them.

Linseed Meal.—It has been brought to notice that under the name "linseed meal" has been offered for sale, not what one would expect linseed meal to be—viz., the bruised or ground seed, still containing all, or nearly all, the oil—but ground up linseed cake. A sample recently examined contained only from 6 to 7 per cent. of oil, whereas linseed has from 30 to 35 per cent. of oil. A farmer buying "linseed meal" would naturally expect to get the seed with its oil, and it would be because of its richness in oil that he would use the meal instead of the cake. If linseed has been ground up and then has had its oil in great measure expressed or else removed by chemical means, the residue ought to be sold under some distinctive term that does not mislead the purchaser, and if linseed cake is merely ground up with meal it ought to be called "linseed cake meal," or "ground linseed cake," but not "linseed meal."

Coffee Husks.—A new material found lately as a considerable constituent in a sample of compound feeding cake is coffee husks, the so-called "parchment" of the coffee berry, and worthless as a feeding material.

Foreign Linseed Cakes.—Several of these of inferior quality and impure nature have been met with. In one instance the cake (a hard-pressed one low in oil) was rendered very objectionable by reason of a quantity of horsehair attaching to the cakes, doubtless from the rough horsehair bags used in pressing. A sample of what was sold as "selected Russians" was found to contain nearly 6½ per cent. of sand.

(Signed) J. Augustus Voelcker.

April 5, 1898.

Botanical and Zoological.

Mr. Whitehead (Chairman) reported that the specimens of wheat, barley, oats, and rye, presented to the Society by Professor Henslow fifty years ago, were being remounted at the British Museum under the kind supervision of the Consulting Botanist. The Committee recommended that no fruit-drying demonstrations be held at the Birmingham Meeting this year; but they were of

opinion that such demonstrations should be given at the Maidstone Meeting of 1899.

The following reports had been presented by the Consulting Botanist and the Zoologist respectively :—

Report of Consulting Botanist.

Thirty-five inquiries have been dealt with during the past month. Sixteen of these have referred to the purity and germination of grass and clover seeds.

Further specimens of diseased clover, due to the attack of the parasitic fungus, *Sclerotinia Trifoliorum*, have been received. These have been sent from Kent, Hertfordshire, Warwick, Derby, and Northampton. Five plants from Kent contained thirty-seven sclerotia.

Several cases of damage to trefoil, *Medicago lupulina*, by the same fungus have been investigated. Throughout the middle and South of England the destruction of clover by this parasite has been very serious. The injury is for the most part confined to the part of the plant which is above ground, but in some cases the mycelium has penetrated the root, destroying the tissues and forming sclerotia outside as well as within the root.

It will be important to observe the diseased plants throughout the spring. As the roots are at present for the most part in a healthy and vigorous condition, they continue to form healthy buds at the crown. These may give rise to a healthy clover crop, though this seems not at all likely.

(Signed) WILLIAM CARRUTHERS.

April 4, 1898.

Report of Zoologist.

The applications received by the Zoologist during the past month have, in most instances, had reference to such familiar pests as warble fly, surface caterpillar, black currant gall mite, and bean beetle.

A case of tulip rooted winter oats (due to the presence of the eelworm *Tylenchus devastatrix*) was reported, and one of cucumber roots infested by the eelworm *Heterodera radicicola*.

Four inquiries had reference to the failure of clover crops, and specimens were sent, along with grubs found at the roots, and suspected of being the cause of injury. They were weevil larvæ, doubtless those of the clover weevils of the genus Sitones, and they appeared to be more than usually numerous. Still, they seemed insufficient to account for the failure of the crops.

Microscopic examination of the clover roots, however, showed the presence in each case of the fungus *Sclerotinia Trifoliorum* mentioned recently by the Consulting Botanist as doing great injury to clover this year, and the applicants were referred to him for advice as to treatment.

A case of the larvæ of the large *Otiorrhynchus* weevils doing much harm to hop roots was reported from Worcestershire.

(Signed) CECIL WARBURTON.

April 5, 1898.

Veterinary.

The Hon. CECIL PARKER (Chairman) presented the Committee's recommendations as to the arrangements for the veterinary inspection at the Birmingham Meeting. It had been arranged that the usual lecture on "The Horse's Foot and How to Shoe It" should be given at the shoeing forge in the showyard on the Wednesday of the Birmingham Meeting.

The following report had been received from Professor McFadyean :—

PLEURO-PNEUMONIA AND FOOT-AND-MOUTH DISEASE.—No outbreak of either of these diseases has been reported during the month of March.

ANTHRAX.—The number of outbreaks reported during the four weeks ended March 26, 1898, was 55, making a total of 153 for the first thirteen weeks of the current year, as against 129 in the corresponding period of 1897.

GLANDERS.—During the four weeks ended March 26, 42 outbreaks, with 101 animals attacked, were reported. The total number of outbreaks for the first thirteen weeks of this year was 196, with 375 animals attacked, as against the same number of outbreaks, with 341 animals attacked in the corresponding period of 1897.

RABIES.—No case of this disease was reported during the month of March, and only 6 cases have been reported during the present year. In the corresponding period of last year there were 49 cases in dogs and 10 in other animals.

SWINE FEVER.—During the four weeks ended March 26, 196 outbreaks were reported, making a total of 578 outbreaks for the first thirteen weeks of 1898. In the corresponding period of last year the outbreaks numbered 785.

MISCELLANEOUS.—The number of morbid specimens sent to the Research Laboratory at the Royal Veterinary College in the month of March was 47. These included cases of anthrax, actinomycosis, swine fever, tuberculosis, navel-ill, fowl cholera, parasitic gastritis in sheep, parasitic enteritis in horses, malignant catarrh in sheep, tumours, mange in foxes, &c. Experiments made during the month have proved the transmissibility of fox mange to the dog.

Colonel CURTIS-HAYWARD said that a case had recently occurred which had caused some apprehension amongst agriculturists in his county of Gloucester. A ship which had landed a cargo of live cattle at Liverpool, proceeded to a Severn port in Gloucestershire to discharge grain, taking six men on board to clean up the ship. On arrival, the manure was landed and sold. It would be satisfactory to hear from Sir George Brown whether there was any danger from such a practice.

Sir GEORGE BROWN said that there was not the slightest ground for any real apprehension in regard to the transmission of pleuro-pneumonia by mediate contagion. His Lordship (the President) would recollect the number of experiments which were tried during the time that he was connected with the Privy Council If they brought a diseased animal into contact with a healthy one, they could introduce the disease; but he might assure the Council that it was an indisputable fact that pleuro-pneumonia could not be communicated from one animal to another, unless the animal communicating it were diseased and alive. In short, the phrase which they were in the habit of using was that it was absolutely impossible to communicate pleuro-pneumonia without the intervention of a living diseased animal.

The PRESIDENT said that Sir George Brown had appealed to him, and he recollected the fact referred to in connection with the experiments which had been made when he was President of the Council. Of course all those cases came before him, and he paid great attention to them. It was perfectly superfluous for him to add anything to what had been stated by Sir George Brown, who was an expert and the highest possible authority on the subject. He hoped that the statement which had been made would be satisfactory to the Council, and that it would allay any alarm which might exist in consequence of what had taken place with reference to this ship from Liverpool.

Stock Prizes.

Mr. SANDAY (Chairman) reported that various letters from intending exhibitors at the Birmingham Meeting had been considered, and that instructions thereon had been given to the Secretary. The Sub-Committee appointed in the Manchester showyard on June 26, 1897, to inquire into various matters connected with the administration of the shows, had presented detailed recommendations relating to the Awards Department, and expressed their opinion that the time had now arrived when the judges should be supplied with a copy of the printed catalogue when judging. The Society had already (since 1892) published beforehand in the March number of the Journal the names of the judges proposed to be appointed: those judges most certainly went into the ring with the foreknowledge of many of the animals that would come before them: they recognised many of the herdsmen: and on balance it appeared to the Sub-Committee to be advisable to place the catalogue in the hands of the judges when they entered the ring. The Stock Prizes Committee had decided to adopt this recommendation, and to present it for confirmation by the Council.

Issue of the Catalogue to Judges.

Sir JACOB WILSON, as an old member of the Council, said he could not allow these recommendations to pass without demurring to the proposal to place the catalogue in the hands of the judges. The only argument in favour of this course was that some judges went into the rings with a pre-knowledge of the ownership and pedigree of the animals before them. This was due, no doubt, to their having themselves judged these animals at previous shows. It was thought, also, that it was desirable that the judges who had not had this privilege should be placed on the same footing, and that they should know everything that could possibly be known of the contents of the catalogue. The catalogue, however, did not tell them everything. It did not say what prizes the animals had previously won. But the argument was that they wanted by means of the catalogue to put the other judges in the same advantageous position as those to whom the animals were known. He ventured to think it was a great question whether there was any advantage in doing so. He happened to have been a witness at a very important show, where the catalogue was placed in the hands of the judges, and where one judge put his catalogue into his pocket, and did not withdraw it until the end of the judging, as his desire was that he should perform his duty with an un-

biassed mind from every point of view.

This had been the opinion of those men who went before them in the organisation of the Society, and for fifty years the plan had, on the whole, worked satisfactorily. He ventured to say that the judging of the Royal Society would bear very favourable comparison with that of any other society in the world. If he asked who were the great advocates for this change, he found from the conversations he had had that they were the large, influential, and wealthy exhibitors or their representatives. He appeared there to remind them that there was another large body of exhibitors—the small exhibitors and tenant farmers—whom they wanted to come into the showyard, and who were reluctant to exhibit because they thought that there was a prejudice against them. The Yorkshire Society had adopted this plan some years ago; but at the present moment that Society did not place the catalogue in the hands of its judges, and no doubt had a very good reason for not doing so.

He would, however, put the matter upon the broad ground that they had gone on very well, and that there were as wise men in the early days of the Society as there were now. Certainly for the last twenty-five years some men went into the judging ring with a knowledge of the animals and some without, but he protested against the idea that by a levelling-down process they would get rid of an evil. On the contrary they would perpetuate and emphasise it. It was not a small matter, and he could not think that the change ought to be made in this way. Yesterday he stood alone in the Committee, and he then urged that the matter might be postponed for a little time, because it was too revolutionary to be settled in a moment. To give them an idea that opinion in favour of the proposal was not universal, it was only the other day that the Council of a Scottish society decided not only not to allow the catalogue to be given to the judges, but also not to allow the owner or the owner's son to lead the animals into the ring.

He asked the Council to pause before they plunged into this very revolutionary measure, which was not urgent, which was in the hands of the large exhibitors, and which would have the effect of deterring the small exhibitors. He moved that the proposal be omitted from the report of the Committee

Mr. GARRETT TAYLOR would not have said anything at all were it not for one remark of Sir Jacob Wilson—viz., that they, the majority of the Committee, had taken advantage of the fact that Sir Jacob stood alone. They had no knowledge as to whether they were in a majority or not until the division. They simply felt that the matter had been thoroughly threshed out by the Committee, and that it had been discussed in different ways for some time.

Sir NIGEL KINGSCOTE was pleased to think that the Committee had made that recommendation. He could not agree with Sir Jacob Wilson in this matter. His argument was that by putting the catalogue into the hands of the judges the poorer men did not get a chance. He looked upon it as quite the other way. He thought the judges ought to have every information they wanted. He had himself judged horses on many occasions; and although it would not make the least difference in his awards, he should like to know the age, the breeding and everything else connected with the animal. A similar discussion by the Council had taken place in 1874, when he (Sir Nigel) had stated that he "could not conceive any objection to furnishing the catalogue to the judges. In his opinion it was better that they should know everything than only a little." He now repeated that opinion, and he was glad that the Committee had made this recommendation.

The Earl of FEVERSHAM said it appeared to him that what the Council desired was that the judges should bring to bear in their judgment the greatest amount of impartiality that could possibly be conceived. The question, then, was, Would there be more impartiality, or was there likely to be any undue bias in favour of one person more than

another by the judges seeing or not seeing the catalogue? He was disposed to agree with his friend Sir Jacob Wilson that the judges would be more entirely impartial if they did not see the catalogue.

The Hon. CECIL PARKER supported the recommendation of the Committee, and said he thought that his Lordship had forgotten that the names of the judges were published some time before the show, and that anyone could tell the judge the number of his animals after he had received his admission papers. At present nothing could prevent the judge, if he were a little late in entering the showyard, from buying a catalogue before entering the ring.

The Earl of JERSEY said that one would not wish to cast any slur upon the judges, but anyone who was capable of doing what Mr. Parker had described would be unfit to be a judge at all. At the same time he thought that in the general interests it would be better that the judges should not know the names of the owners of the animals. A man went much more freely to judge an animal if he did not know in the least to whom it belonged, and he could not therefore be influenced. But if he knew that an animal belonged to a well-known herd, he might give it, perhaps, extra attention. Looking at the matter from a general point of view, he thought it would be better that the judges should be supposed not to know to whom the animals belonged.

Sir Jacob Wilson's amendment, seconded by Lord FEVERSHAM, was then put by the PRESIDENT, and declared lost by twenty-one votes to ten; and the report of the Stock Prizes Committee was adopted *nem. con.*

Maidstone Meeting of 1899.

On the motion of Mr. SANDAY, it was resolved that the sum of 5,000*l.* be placed at the disposal of the Stock Prizes Committee for providing prizes for live stock, poultry, produce, &c., at the Maidstone Meeting of 1899.

Judges' Selection.

Mr. SANDAY (Chairman) reported that the list of judges for the Birmingham Meeting had been duly published in the last number of the Journal. The umpires to act in cases of necessity had been selected from the list of judges.

Implement.

Mr. FRANKISH (Chairman) reported that the Allotment Committee had arranged the positions of the stands in the Implement Department of the Birmingham Meeting, and that the space applied for was practically identical with that allotted at Manchester last year. Nine entries had been received for the trials of self-moving vehicles, which were fixed to take place on Monday, June 13th, in the neighbourhood of Sutton Coldfield. Seventeen entries had been received for the best method of safeguarding chaff-cutters, the trials of which were fixed to take place in the showyard on Friday, June 17th.

The Committee recommended the adoption of the following regulations for the trials of hop-washing machines, entered in competition for the Society's prize of 50*l.* "for the best machine for washing hops with liquid insecticides, to be worked by horse power or mechanical power":—

REGULATIONS FOR THE TRIALS OF HOP WASHERS.

1. For the exhibition of hop washers for competition, sufficient space must be taken by exhibitors under the ordinary regulations.

2. No exhibitor may enter for competition more than one machine of the same construction. The decision of the Stewards as to whether differences in the construction of machines are sufficiently great to constitute them different machines shall be final and binding.

3. The specification of every machine entered for competition must include the words "entered for competition," so as to identify it in the catalogue, otherwise such exhibits will be disqualified from competing for the prizes offered. Detailed descriptions of the machines entered for competition must be forwarded on special forms which will be sent by the Secretary for the purpose.

4. The trials will be held in a Kentish hop garden about the time of the Maidstone Meeting in June, 1899. Notice of the exact place and date of the trials will be posted to every competitor as soon as possible after they have been fixed, and all machines entered for competition must be delivered at the place of trial by the date fixed in that notice.

5. Every competitor must himself provide for the delivery of his machine to the place of trial, and for its removal at the conclusion of the trials to his Stand at the Maidstone Meeting.

6. The points to which the special attention of the judges will be called are :—

Adaptability to different modes of training hops, *e.g.*, different widths of planting; perpendicular string; slanting string; poles, etc.
Ease of regulating quantity of insecticide used.
Efficiency of work.
Lightness of draught.
Price.
Strength and simplicity.
Weight and capacity of machine.

7. The machines will be tried with a solution of soft soap and quassia, to be provided by the Society. Competitors' own insecticides will not be used at the trials.

8. Exhibitors are requested to be in attendance during the trials; and they or their servants must give every facility to the Stewards by preparing their exhibits for inspection. Any exhibitor, after having had due notice, will be liable either to have his exhibit worked at his own risk in his absence, or to have it removed altogether from the trial field, as the Stewards may decide, and without any responsibility attaching to the Society in consequence.

9. Should the judges find any number of machines to be of practically equal merit, they are empowered to bracket them as equal, and so divide the prize-money.

10. The entries must be made on or before Wednesday, March 15, 1898, and must be accompanied by a deposit of *5l.* for each entry. Such deposit will be forfeited if the machine is not submitted for competition at the time appointed for the trials.

(Signed) ERNEST CLARKE, Secretary.
13 Hanover Square, London, W., *April*, 1898.

General Birmingham.

Mr. RYLAND presented a report from this Committee dealing with a variety of details relating to the forthcoming Birmingham Meeting, including the question of railway facilities, local cab and omnibus fares, meetings in the showyard, &c.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the entrances and the dairy were now in an advanced state, the framework of the grand stand was completed, and the stables for horses well in hand. About 6,900 feet of implement shedding had been erected, and the machinery-in-motion sheds commenced. The Local Committee had begun to lay the sleeper road to the entrances, and the levelling of the site was nearly completed. Other details relating to the laying on of water, refreshments, and the sales of timber after the show had been discussed and settled.

Selection.

Sir JOHN THOROLD (Chairman) presented a list of the attendances during the last two years of the twenty-five members of Council who retired at the next general meeting. It appeared from this list that all the retiring members were eligible for re-election, with the exception of the Duke of Devonshire who had not been able to attend the Council during the two years. In view of the Society's Bye-law 23 (*b*), the Committee recommended that the Duke of Devonshire's name be omitted from the House List for re-election at the general meeting.

The following list shows the number of attendances at Council and Committee meetings, during the past two years, of the twenty-four Members of Council who retire by rotation, and are eligible for re-election :—

Attendances at Meetings of Council and Committees from April, 1896, to March 1898, inclusive	Council Meetings. Total number, 18	Committees: No. of Meetings	Committees: Attendances
ARKWRIGHT, J. HUNGERFORD	11	95	48
BEDFORD, Duke of	5	9	1
BLAKE, GEORGE	8	30	4
BROUGHAM AND VAUX, Lord	10	55	26
CURTIS - HAYWARD, Lieut.-Colonel J. F.	15	84	71
FOSTER, S. P.	8	41	16
FRANKISH, W.	18	121	97
GRANBY, Marquis of (elected May 22, 1896)	6	8	—
GRANVILLE, R. NEVILLE	10	48	26
HORNSBY, JAMES	16	34	27
LEVETT, Capt. W. S. B (elected April 7, 1897)	4	11	7
MARSHALL, H. D. (elected November 2, 1897)	2	2	1
MUNTZ, P. A., M.P.	8	6	—
PIDGEON, DANIEL	9	32	16
RANSOME, J. E	14	48	39
ROGERS, C. C. (elected May 5, 1897)	5	6	5
RYLAND, HOWARD P.	10	57	34
SANDAY, G. H.	18	89	78
SMITH, HENRY	11	39	19
STRATTON, RICHARD	8	—	—
SUTTON, MARTIN J.	14	58	49
WARREN, R. A.	14	16	14
WHEELER, E. VINCENT V.	14	79	57
WILLIAMS, J. C. (elected February 2, 1898)	1	—	—

Sir NIGEL KINGSCOTE said that everyone would regret that they were obliged under the bye-laws to remove the name of the Duke of Devonshire from the list of the Members of Council to be elected at the General Meeting; but, under the circumstances, he thought he could not do better than nominate Mr. Victor C. W. Cavendish, M.P., who had expressed his willingness to serve on the Council, if elected. He therefore handed in a formal nomination of Mr. Cavendish, duly signed by himself and by the Hon. Cecil T. Parker, in accordance with the requirements of Bye-law 23 (*c*).

The PRESIDENT thought that the Council would regret very much that the Duke of Devonshire had not been able to attend their meetings, owing, doubtless to his many occupations. It was an excellent proposal that Mr. Victor Cavendish, who, he knew, took a great interest in matters connected with agriculture, should be nominated as his successor.

Education.

Mr. DUGDALE reported that forty-eight entries had been received for the Society's forthcoming examination in agriculture to be held from the 10th to the 14th of next month. The Committee recommended that the examination be held at the Examination Hall on the Thames Embankment as last year, and that the conference of the examiners after the examination be fixed for Monday, May 23, at 10 30 A.M.

Dairy.

Mr. GARRETT TAYLOR reported that progress had been made with the arrangements for the dairy at the Birmingham Meeting, and that various questions connected with the exhibition of butter in classes 327 and 328 had been settled.

Country Meeting of 1900.

The SECRETARY read a letter received that morning from the Lord Mayor and City Council of York, inviting the Society to hold its Country Meeting of 1900 at York, and stating that if the invitation should be accepted by the Society, every effort would be made to make the Meeting a success. This invitation was cordially received, and on the motion of Sir JACOB WILSON, seconded by Mr. MARTIN, a Committee of Inspection, consisting of the Hon. Cecil T. Parker (Honorary Director), Mr. Crutchley, and Mr. Rowlandson, was appointed to visit York to confer with the Local Authorities; and it was arranged that a deputation from the City and County of York should be asked to attend the next meeting of the Council on May 4th to formally convey the invitation.

Date of Next Meeting.

Other business having been transacted, the Council adjourned until Wednesday, May 4th next, at noon.

WEDNESDAY, MAY 4, 1898.

EARL SPENCER, K.G. (PRESIDENT), IN THE CHAIR.

Present:

Trustees.—H.R.H. the Prince of Wales, K.G., General Viscount Bridport, G.C.B., Colonel Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart.

Vice-Presidents.—The Earl of Feversham, the Right Hon. Sir Massey Lopes, Bart., Lord Moreton, the Earl of Ravensworth, Sir John Thorold, Bart., Mr. Charles Whitehead.

Other Members of Council.—Mr. Alfred Ashworth, the Duke of Bedford, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. F. S. W. Cornwallis, M.P., the Earl of Coventry, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. A. E. W. Darby, the Earl of Derby, K.G., Mr. J. Marshall Dugdale, Mr. S. P. Foster, Mr. W. Frankish, Mr. Hugh Gorringe, Mr. R. Neville Grenville, Mr. James Hornsby, Mr. C. S. Mainwaring, Mr. Henry D. Marshall, Mr. Joseph Martin, Mr. P. A. Muntz, M.P., Mr. A. E. Pease, M.P., Mr. Albert Pell, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. C. C. Rogers, Mr. S. Rowlandson, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. A. J. Smith, Mr. Henry Smith, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. J. C. Williams, Sir Jacob Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. R. S. Burgess, Superintendent of the Showyard.

Professor Sir George Brown, C.B.; Professor McFadyean.

Mr. W. H. Lythall, Secretary of the Birmingham Local Committee.

Apologies for non-attendance were received from the Marquis of Granby, the Earl of Cawdor, the Hon. C. T. Parker, Mr. J. H. Arkwright, Mr. H. Chandos-Pole-Gell, Mr. Dan. Pidgeon, Mr. E. W. Stanyforth, and Professor J. B. Simonds.

The minutes of the last monthly Council, held on April 6th, 1898, having been taken as read and approved, the election of the following sixty-five members was proceeded with.

Members.

ASHMALL, H. W...Linton, Burton-on-T.
BARKER, H. E...Sutton Pk., Birmingham.
*BRADBURNE, H...Chesterfield, Lichfield.
CHARRINGTON, H...Castle Hill, Tutbury.
COBB, G...Cleaving Grange, Londesborough.
COLOMBO, A...Govt. Botan. Gdns, Cairo.
CRAKE, L. H...31 Norfolk Crescent, W.
DAVIES, J. A...Eglwys Brewis, Cowbridge.
DOWSETT, J. M...Worple Rd., Wimbledon.
EXETER, Marquis of..Burghley House, Stamford.
FORDHAM, S. H...Cheyneys Lodge, Steeple Morden, Royston.
FOSTER, W...Alkborough, Doncaster.
GAISFORD, E...Holbrook, Ipswich.
GOODALL, J...Drakelow, Burton-on-T.
GREEN, A...King St., Dudley.
GREENER, C. E...Chester Rd., Erdington, Birmingham.
HAMILTON, H. A. C...Monk Friston, S. Milford, Yorks.
HAYHURST, F. France..Marton Grange, Myddle, Salop.
HAYHURST, Capt. W. H. France..Marton Grange, Myddle, Salop.
HAYNES, Horace E...Evesham.
HILL, H. W...Brockhill Ct., Shelsley Beauchamp.
HOLLAND, C...Chiswell Manor, Newport, Salop.
HOLMES, E. B...The Homestead, Dudley.
HOLMES, G...Winterton, Doncaster.
HUDSON, R. W...Danesfield, Great Marlow.
HUMPHREY, R. H...Neasham Grange, Darlington.
JEWELL, W. H...33 Streatham Hill, S.W.
JOLLIFFE, C. H...Goldicote, Stratford-on-Avon.
KNIGHT, C. R. B...Chichester.
KNYFTON, R. B. G...Uphill Castle, Weston-super-Mare.
LIPPINCOTT, R. C. Cann...Over Court, Bristol.
MAPLE, Sir J. Blundell, Bart., M.P...Clarence House, Regent's Park, N.W.
MILLER, F...160 Borough Road, Birkenhead.
*MILLER, W. S...Forest Lodge, Brecon.
MORSE, Edward..Mouleigh, Torrington.
MUMFORD, A. H...Creeting St. Peter, Needham Market.
NEALE, Wm...Bacon's End, Coleshill, Birm.
PALEY, A. E...1 Marsh St., Walsall.
PARR, T. N...155 Mansfield Rd., Nottingham.
PAULET, C. S...Stable Hill, Wellesbourne, Warwickshire.

* Reinstated under Bye-law 12.

PAULET, Lord Henry..Cold Newton, Leicestershire.
PEACHEY, E. S...Eashing, Godalming.
PETERS, Capt. L. C...H.M.S. *Grafton*, China Station.
PURSON, O. M...Swinfen, Lichfield.
QUILTER, E. F...Belstead, Suffolk.
RANDALL, J...Moseley, Birmingham.
RUDSTON, G. C...Allerthorpe Hall, York.
SAVILE, Lord..Rufford Abbey, Ollerton, Notts.
SHANNON, J. C...Inglewood, Sutton Coldfield.
SMERDON, W. R...Spriddleston Barton, Devon.
SMITH, E...King's Norton, Birmingham.
SMITH, J...Monkton, Willington, Hereford.
SNELL, E. W...Chain House, Needham Market.
SPILMAN, J...Clinby, Caistor.
SPINK, T. M...Walcot, Doncaster.
STOOKE, J. E. H...27 South Bar, Banbury.
SYKES, A. H...Edgeley, Stockport.
TAYLOR, R...Pitlivie, Carnoustie, Forfar.
THOMAS, J. L...Castle Hill Works, Norwich.
THORNICROFT, J...Metchley Park, Edgbaston.
TOMKIN, G. T...The Moat, Marden, Kent.
TOTTENHAM, G. L...Glenade, co. Leitrim.
WHITE, E. E. L...Jodrell Hall, Cheshire.
WILSON, E. W...Spennymoor House, Durham.
WOODIWISS, E. S...Upminster, Essex.

Country Meeting of 1900.

Mr. CRUTCHLEY read the report of the Committee of Inspection, appointed by the Council at their last meeting to visit York to confer with the local authorities on the subject of the invitation which had been received from the City Council of York for the holding at York of the Society's Country Meeting for the year 1900. The report stated that the Committee visited York on April 26, and that they had inspected the site offered for the purposes of the Meeting, which was situated on the well-known Knavesmire, consisted of about 100 acres, and was about a mile from the centre of the city. The Committee had no hesitation in recommending the Council to accept the invitation.

This report having been received and adopted, the Earl of FEVERSHAM introduced a deputation consisting of the Lord Mayor of York (Mr. Alderman Gray), the Marquis of Ripon, K.G., Earl Cathcart, Lord Wenlock, G.C.S.I., Rear-Admiral Lord Charles Beresford, C.B., M.P., Alderman Sir Christopher Milward, Mr. Alderman Mackay, Mr. Alderman Sykes Rymer, Mr. Councillor Page, and the Town Clerk of York (Mr. W. H. Andrew). Lord Feversham said that the Council were well aware of the advantages which the City of York had to offer, and he would remind them that the Society had already been to York on former occasions, when it had held most successful exhibitions. He believed that if the Society again visited their most excellent city it would receive the same hospitable reception, and meet with the same success.

The Lord Mayor of YORK said it only remained for him to formally invite the Society to hold its Meeting of 1900 at York. They had, he was very happy and proud to say, not only their own Corporation very worthily represented that day, but also the kind support of Lord Ripon, Lord Cathcart, and Lord Wenlock. Lord Charles Beresford had snatched a moment or two to give them the weight of his presence. Mr. Butcher, M.P., would have been present, but had been prevented from attending by other engagements. They were there out of love for their county and continual public spirit in all matters that tended to its welfare. As to the railway conveniences of York, the Committee who visited the city would be able to speak. They desired to assure the Council that a very hearty welcome would be given to the Society, and that no effort would be spared to make the show worthy of the county.

The Marquis of RIPON said it was almost superfluous for anyone to expatiate on the facilities afforded by so well-known a city as York for the Meeting of the Royal Agricultural Society. It would be seventeen years in 1900 since the Society visited York; and they ventured to think that, looking to the position of the city of York and the conveniences it offered, they might fairly urge a claim to receive another visit from the Society after so long a period. They all knew the railway and other facilities of the city and county of York, and he might venture to say, without disparaging any other county, that no place had greater claims upon the consideration of the Society than Yorkshire.

The PRESIDENT said he need not assure the deputation what an immense gratification it was to receive their invitation to visit York in 1900. The historical position of York in the North of England, its public convenience with regard to railways, and its

many other attractions, undoubtedly made that city a most desirable place for the visit of the Royal Agricultural Society. They had agreeable recollections of the shows in former years. He had great satisfaction in announcing to the deputation that the Council had agreed to visit York, and to accept the invitation which had now been formally received from their hands. He had only to express to them the thanks of the Society, on their own part and on the part of agriculture generally, for this invitation, and also to thank them very much for coming there that day.

In reply to a question put by the PRESIDENT as to the regulation of omnibus fares to and from the showyard,

The TOWN CLERK stated that the law at York was the same as in London and other places—viz, that omnibuses might charge what they pleased, so long as the fares charged did not exceed those displayed inside the omnibus.

The deputation having withdrawn, the following resolution was unanimously passed, on the motion of H.R.H. the Prince of WALES, K.G., seconded by Mr. ALFRED E. PEASE, M.P.: "That the Country Meeting of 1900 be held in the city of York, subject to the usual agreement being entered into with the Society by the Lord Mayor and Corporation."

The Reports of the various Standing Committees were then presented and adopted as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the month of April, 1898, as certified by the Society's Accountants, showed total receipts amounting to 4,011*l.* 16*s.* 5*d.*, and expenditure amounting to 3,352*l.* 8*s.* 9*d.* Accounts amounting in all to 3,280*l.* 18*s.* 7*d.* had been passed, and were recommended for payment.

Sir NIGEL KINGSCOTE said that the Council would be aware that at their last meeting the Finance Committee had suggested that in view of the rapidly increasing work in all departments of the Society's operations, and of the imminent resignation by the Hon. Cecil Parker of the post of Honorary Director, a Committee be appointed, to consist of the President, Sir Nigel Kingscote (Chairman of the Finance Committee), Sir John Thorold (Chairman of the Special Committees of 1887 and 1892), and Mr. Sanday (Chairman of the Committee appointed in the Manchester Showyard), with power to call for evidence from past and present officials of the Society, both honorary and paid, and with instructions to report to the Finance Committee, in order that recommendations might, if possible, be brought up at that meeting of the Council.

This Committee had sat on May 2, and had presented the following report:—

1. Having examined Mr. Parker, Sir J. Wilson, and Sir E. Clarke, the Committee have arrived at the conclusion that the arrangements connected with the annual shows have so enormously increased of late years as to entail so much work on the Hon. Director as to make it impossible for anyone acting in that capacity to carry out what is expected of him.

2. This has necessarily thrown much extra work on the Secretary, whose duties connected with the administration of the other branches of the Society are quite sufficient to fully occupy his time.

3. The Committee are persuaded from the evidence of all those who came before them that, while retaining the office of Hon. Director, it is absolutely necessary for the proper conduct of the affairs of the Society, and especially for the efficient working of the shows, that a permanent paid official, directly responsible to the Council, should be appointed, whose duties would be principally confined to all matters relating to the show and showyards.

4. If this proposal should be approved, the Committee suggest that this official should be called "Assistant Director," and that his salary should commence at 700*l.* per annum, with travelling and hotel expenses.

Having carefully considered these recommendations, the Finance Committee recommended their adoption by the Council.

The PRESIDENT said that as he had had some experience during the past year in the working of the Society, he thought it only right to state that he entirely concurred, and saw the necessity for the important change of giving a paid assistant to the Honorary Director. The work of the Society had increased in every possible way. Not only had the work increased of its important Committees (and he ventured to say that some of the most important work of the Royal Agricul-

tural Society was done by those Committees), but the work thrown upon the officials had also increased, and especially the work of the Secretary, who at times had been obliged to take compulsory rest in order to overcome the fatigue to which he had been subjected. The work of the show had become so onerous, not only before but also subsequently to it, that it had become impossible for the Honorary Director to attend to it efficiently. It was, therefore, very important that the Council should adopt this proposition, which had been made by a Special Committee to the Finance Committee.

The Report of the Finance Committee was then adopted, including the recommendations of the Special Committee.

House.

Sir NIGEL KINGSCOTE (Chairman) reported the completion of the work of repainting the outside of the Society's house. He also reported the purchase of a coloured print of "The Durham Ox," which print had previously belonged to the late Mr. Charles Howard, and the gift by Mr. J. E. Ransome of an engraved portrait of his late brother, Mr. R. C. Ransome, a Member of the Council from 1868 to 1886. The thanks of the Society were due to Mr. Ransome for this very acceptable gift.

Journal.

Sir JOHN THOROLD (Chairman) reported that various accounts for printing, &c., had been passed, and were recommended for payment. The Editor's proposals for the contents of the next number of the Journal had been considered, as well as suggestions for articles and notes.

Chemical and Woburn.

Mr. WARREN presented the following report by the Consulting Chemist:—

Report of Consulting Chemist, May, 1898.

FISH MANURE (so called).—A member made a purchase, at the price of 53*s.* per ton at the works, of a material called "Fish Manure." On analysis, however, it proved to be practically nothing but gas lime and a little fish offal. The value of it certainly was not above 5*s.* or 6*s.* a ton, and it would not have been worth carting any distance. The analysis was :—

Moisture	28·43
*Organic matter	15·09
Phosphate of lime	1·44
Carbonate and sulphide of lime, &c.	39·92
Siliceous matter	15·12
	100·00
*Containing nitrogen	·57
Equal to ammonia	·69

After receiving the report the purchaser sent back the portion still unused. It was intended for use on potatoes.

BONE COMPOUND.—Under this name a variety of manures are sold. Many of them are excellent materials, frequently most reasonable in price, and meeting the wants of the farmer who, while liking to have some bone in the manures he used, is kept back by the higher price of pure dissolved bones. In other cases, however, there is found only just enough bone to justify the use of the word "bone," and not infrequently additions are made in the form of nitrate of soda, &c., which make the analytical results appear favourable, but which give a wrong impression to the person who supposes that the nitrogen in the manure is derived mainly from bone, and hence not so readily removed from the soil as would be that derived from nitrate of soda. In the following instance :—

	Phosphates soluble and insoluble.	Phosphates of which are soluble.	Nitrogen.	Equal to ammonia.
	Per cent.	Per cent.	Per cent.	Per cent.
The guarantee was ..	20–24	16–18	2·27–3·29	3–4
The actual analysis gave	20·91	16·39	3·18	3·86

The guarantee, accordingly, was satisfied; but the manure was, on examination, found to consist mainly of mineral superphosphate and nitrate of soda, with just a little bone thrown in. Practically, the whole source of nitrogen was the nitrate of soda and not bone. The price asked was 7*l.* per ton, less 10 per cent. for cash, a price which, considering the composition of the manure, was much beyond its real value.

STEAMED BONE FLOUR.—Reference was made last month to bone flour made by a new process involving the use of sulphurous acid and the consequent formation of sulphite of lime, which is injurious to vegetation. Further samples have since been received, and the warning is accordingly repeated.

SEWAGE MANURES.—How to make a profitable manure out of the solid matters from sewage works has for a long time engaged the attention of local authorities and individuals. That no profitable outlet, so far as the manufacturers are concerned, has come as yet is well known. But to the farmer it is well to point out that there is frequently very considerable variation in the quality of the different materials offered to him as having their base in sewage, though the prices may not be widely different. The following analyses of samples recently sent by members clearly show this :—

	A	B	C
Moisture	5·45	14·35	15·24
Organic matter ..	42·05	32·60	42·86
Phosphate of lime ..	3·49	4·23	12·79
Carbonate of lime, oxide of iron, &c.	39·86	12·56	12·16
Insoluble siliceous matter	9·15	36·26	16·95
	100·00	100·00	100·00
Nitrogen	1·39	1·78	4·39
Equal to ammonia ..	1·68	2·16	5·33

A cost 2*l.* per ton; B cost 3*l.* 10*s.* per ton delivered, less 10 per cent. for cash on taking a quantity; C cost 2*l.* 17*s.* per ton delivered.

A comparison of the analyses will show that there is very considerable difference of value between the three manures, and that C is worth more than twice as much as either of the others. Of A, it may be said that it is too dear at the price; of B, that it is "extravagantly dear"; while C is, on the whole, a good manure, quite worth the price.

Gun Wad Waste.—A sample was sent of the pieces of the felt left from the cutting out of wads used in loading cartridges. This gave:—

Nitrogen	6·69 per cent.
Equal to ammonia ..	8·13 per cent.

But, at the price asked—viz., 2*l.* 14*s.* per ton on rail—this material must, considering the difficulty of getting it into a form capable of ready and economical application, be taken as decidedly too dear. It was intended for hops.

Russian Linseed Cake.—Last month was reported a case in which cake sold as "selected Russians" was found to have nearly 6½ per cent. of sand. Since then an instance has been brought to notice in which a sample of "Russian linseed cake" was guaranteed to be of "95 per cent. purity, and to contain over 12 per cent. of oil." Analysis showed:—

Oil	10·77 per cent.
Sand	2·40 per cent.

in addition to which the cake had a large quantity of weed seeds, more particularly spurry, and was a very impure cake.

(Signed) J. Augustus Voelcker.

May 2, 1898.

Mr. Warren added that it was proposed that June 8 should be fixed as the date for the Committee's visit to the Woburn Experiments, which would this year be specially interesting, in view of the new pot experimental station now in working order.

Botanical and Zoological.

Mr. Whitehead (Chairman) presented the following report by the Consulting Botanist:—

Report of Consulting Botanist.

Eighty-six inquiries have been made during the past month on the part of members of the Society. For the most part these have concerned seeds. Forty-one samples of grasses, 30 of clover, and 7 of turnips have been examined and tested for germination.

The young leaves of a plant sent from Wiltshire were said to have caused the death of a number of lambs. They were leaves of *Ranunculus Flammula*, a very acrid plant, which, if bruised and applied externally, inflames and blisters the skin, and when taken into the stomach acts as a violent emetic. Information, though asked for, has not yet been obtained as to the symptoms of the malady which preceded the death of the lambs. This plant, usually called the Lesser Spearwort, grows in marshy ground and wet places, and in surface ditches.

Serious injury to pastures was investigated caused by the spread of *Brachypodium pinnatum*, a grass which is rejected by all stock, and consequently bears abundance of seed. The seeds are carried to a distance by the wind; wherever a seed grows it forms a round patch which enlarges every year until the various patches meet and cover large portions of the pasture, rendering it unsightly and useless. This grass should never be allowed to seed. Where small patches exist they should be forked out, and where large areas are covered by it they should be broken up and fallowed or cultivated with root crops in order to thoroughly clean the land before it is laid down again.

Serious cases of larch canker have been investigated. There can be no doubt that the disease gets into many plantations from the nursery. Seedling larch trees should perhaps be bought subject to a guarantee that they are free from canker. At least every consignment of young trees should be carefully examined before planting, and when diseased specimens are found the whole consignment should be returned. The canker is a most destructive disease, rendering the attacked trees of small value for timber.

Information continues to come in as to the ravages of *Sclerotinia Trifoliorum* on clover and allied crops. In some places sainfoin has been to a large extent destroyed. Wherever the fungus has penetrated the roots, the plants are entirely destroyed, but where it is confined to the parts of the plant above ground new and apparently healthy shoots are being developed. Such plants are being kept under observation with the view of seeing whether they escape the attack of the fungus.

(Signed) William Carruthers.

May 2, 1898.

The Zoologist had been authorised to visit Devonshire to investigate the apple pest should it prove to be the American apple maggot, *Trypeta pomonella*, as he anticipated.

Veterinary.

Col. Curtis-Hayward presented the following report by Professor McFadyean:—

Pleuro-Pneumonia and Foot-and-Mouth Disease.—No case of either of these diseases has been detected in Great Britain during the last four weeks.

Anthrax.—During the four weeks ended April 23, 1898, there were 53 outbreaks, with 102 animals attacked. The outbreaks for the first seventeen weeks of this year number 206, with 346 animals attacked, as against 167 outbreaks and 380 animals attacked in the corresponding period of 1897.

GLANDERS.—During the same period 51 outbreaks and 88 cases of this disease were reported, making a total of 247 outbreaks and 463 animals attacked during the first seventeen weeks of this year. During the corresponding period of last year the outbreaks numbered 250 and the animals attacked 475.

RABIES.—Two cases of rabies in the dog have been reported during the last four weeks, one of which occurred in Lancashire and the other in Warwickshire. The total number of cases reported during the first seventeen weeks of this year is 9 (all in dogs), as against 65 cases in dogs and 10 in other animals during the corresponding period of 1897.

SWINE FEVER.—This disease continues to increase. The outbreaks reported during the four weeks ended April 23, 1898, numbered 256, as against 196 in the preceding four weeks, and 217 for the corresponding period of 1897. The total outbreaks for the first seventeen weeks of 1897 and 1898 were respectively 1,002 and 834. Swine fever was detected among a cargo of pigs from the United States, landed at Deptford during the month of April.

MISCELLANEOUS.—The number of morbid specimens forwarded to the Research Laboratory at the Royal Veterinary College during the month of April was 41. These comprised cases of malignant tumours, anthrax, tuberculosis, swine fever, contagious aphtha (in lambs), parasitic enteritis and gastritis, infectious diarrhœa (in calves), pneumonia, inflammation of the udder, pyæmia, &c.

Professor McFadyean had also stated that the mortalities amongst calves belonging to a tenant of a member of the Society in Staffordshire had been ascertained to be due to scour, which was generally an infectious malady, and in this instance was particularly so. He had suggested that the animals should not be allowed to calve in the same place, and since the adoption of this plan no fresh case had occurred. It was also recognised that in such cases the cows should, if possible, be allowed to calve in the open air, as in a field.

Having considered a set of draft regulations prepared by Sir George Brown and Professor McFadyean for the future annual award of the Society's Silver and Bronze Medals to Students of Cattle Pathology, the Committee recommended that these Regulations be adopted by the Council, as follows:—

Medals for Students of Cattle Pathology.

1. The Royal Agricultural Society will award annually a silver medal to the student who obtains the highest number of marks, and a bronze medal to the student who obtains the next highest number of marks, in a special examination to be held at the close of each session, and who at the immediately ensuing diet of the Examining Board pass the final examination of the Royal College of Veterinary Surgeons.

2. The competition will be open to all students of the Royal Veterinary College, Camden Town, who have completed their course of study, and who are eligible for the final examination of the Royal College of Veterinary Surgeons.

3. The examination will be conducted by the professors of the Royal Veterinary College, and will comprise a written, an oral, and a practical examination.

4. The subjects of the examination will be the diseases of cattle, sheep, and swine, and the dentition of these animals as an indication of age.

Letters had been read from exhibitors who had entered pigs for the Birmingham Meeting, but whose districts had since been declared "swine-fever infected areas." The Committee recommended that no pigs be received for exhibition at the Birmingham Meeting from districts declared to be infected with swine fever, in accordance with the procedure adopted by the Council during recent years.

Copies of the Report of the Royal Commission on Tuberculosis had been laid upon the table, and the Committee recommended that the following resolution be adopted by the Council and forwarded to the President of the Local Government Board:—

The Council strongly desire to express their concurrence with the recommendations of the Royal Commission on Tuberculosis with regard to the amount of cubic air space in cowsheds, especially with that part of the Report which draws a distinction between the requirements in populous and non-populous places, whether technically urban or rural.

This resolution, formally moved by Sir NIGEL KINGSCOTE and seconded by Colonel CURTIS-HAYWARD, was unanimously adopted, and ordered to be transmitted to the President of the Local Government Board, the PRESIDENT observing that it was a matter of congratulation that this important Commission had dealt with this question of air space—which had agitated the agricultural mind—in the way that it had.

Stock Prizes.

Mr. SANDAY (Chairman) reported that directions had been given as to various questions arising out of the entries for the Birmingham Meeting.

In reply to letters inquiring whether sheep might be exhibited with a lock of wool left on the shoulder to show the staple, it had been decided that, in view of the regulations as to shearing, animals could not be exhibited which had not been completely shorn bare. Therefore sheep with a lock of wool, as described, would not be eligible to compete for the Society's prizes.

Judges' Selection.

Mr. SANDAY (Chairman) reported that all the judges invited to act at the Birmingham Meeting had accepted office. The Committee recommended the appointment of Mr. A. S. Berry, of Pheasey Farm, Great Barr, Birmingham, and Mr. H. E. Thornley, of Radford Hall, Leamington, as judges of Longhorn cattle.

Implement.

Mr. FRANKISH (Chairman) reported that the allotment letters had been despatched to the exhibitors in the Implement department of the Birmingham Meeting

Professor Unwin, F.R.S, had accepted the Council's invitation to act as judge, and to write the report for the Journal, of the Trials of Self-Moving Vehicles.

General Birmingham.

Mr. RYLAND reported that the programme for the Birmingham Meeting had been provisionally approved. Various applications from breed societies for permission to hold meetings in the showyard had been granted (see p. lxvi). The Committee recommended that the date of their next meeting be fixed for Monday, May 23, at 3 p m, in view of the fact that the meeting of the Council on May 25 would be held at 10.30 a m.

The PRESIDENT said he was sure that it would be a matter of great gratification to the Council when he informed them that he had the permission of His Royal Highness the Prince of Wales to announce that he hoped to be present on one day during the Birmingham Show. (Cheers)

Showyard Works.

Sir JACOB WILSON (Chairman) reported that all the machinery-in-motion shedding was now completed, the entrances and members' pavilion were erected, and the dairy, grand stand, and special shedding were being proceeded with. The Local Committee had finished the levelling and had laid the sleeper roads to the entrances, and the water mains were being laid. Details relating to the water supply, the refreshment department, and telegraphs had been discussed and settled. Instructions had been given to the Consulting Engineer with regard to proposals made by the Maidstone Local Committee as to the water supply for the Maidstone Meeting of 1899.

Presidency for 1898-99.

Sir JOHN THOROLD (Chairman of the Committee of Selection), in presenting the recommendation of the Committee that the name of the Earl of Coventry be suggested to the general meeting as President of the Society for the ensuing year, said they were fortunate in finding in the Earl of Coventry a Member of Council who had attended regularly since 1885, who had filled various public offices, and who was in every way qualified for the Presidency.

Mr. BOWEN-JONES, in seconding the nomination, said they recognised Lord Coventry as being a distinguished agriculturist. On the West-Midland side of the country they also recognised him as a successful breeder and exhibitor of a very ancient and valuable breed of cattle. He had also given good proof of his business qualities as a Member of the Council, as Lord-Lieutenant of his county, and as a supporter of agriculture in many directions.

The PRESIDENT hoped he might be allowed to say what a great pleasure it was to him to make this proposal, which he was sure the Council would adopt unanimously. It was not necessary to say anything about the qualifications of Lord Coventry to fill the post of President. He claimed to be the oldest friend of Lord Coventry in that room, as he remembered many years ago that they were together at the first private school which they both attended.

The recommendation of the Committee having been unanimously adopted,

The Earl of COVENTRY expressed his thanks for the compliment which had been paid him. He said he had been a Member of the Society since 1863, and for the last thirteen years had taken a great interest in the work of the Council. If it should be the good pleasure of the General Meeting to confirm the nomination of the Council, he should rejoice at the opportunity of rendering any service, no matter how humble it might be, in order to help the cause which they all had at heart.

Education.

Lord MORETON (Chairman) presented the following time-table, which had been drawn up for the Society's examination in agriculture to be held next week:—

Tuesday, May 10:—
- Agricultural Engineering 10 a.m. to 1 p.m.
- Bookkeeping .. .. 2 p.m. to 5 p.m.

(Agricultural Engineering, *vivâ voce*, throughout the day.)

Wednesday, May 11:—
- Agriculture (Part I.) .. 10 a.m. to 1 p.m.
- Agriculture (Part II.) .. 2 p.m. to 5 p.m.

(Agriculture, *vivâ voce*, throughout the day.)

Thursday, May 12:—
- Chemistry (General) . 10 a.m. to 1 p.m.
- Chemistry (Agricultural) 2 p.m. to 5 p.m.

(Chemistry, *vivâ voce*, throughout the day.)

Friday, May 13:—
- Land Surveying .. .. 10 a.m. to 1 p.m.
- Geology .. .. .. 2 p.m. to 5 p.m.

(Land Surveying and Geology, *vivâ voce*, throughout the day.)

Saturday, May 14:—
- Veterinary Science .. 10 a.m. to 12 noon.
- Agricultural Entomology 12 noon to 1 p.m.
- Botany .. .. .. 2 p.m. to 4 p.m.

(Veterinary Science, *vivâ voce*, throughout the day.)

The Committee recommended that the first-class certificate in connection with the Society's examination in agriculture should be in future styled "Diploma," and they recommended that a new design be prepared.

Dairy.

Mr. CRUTCHLEY (Chairman) reported the decision of the Committee that Lincolnshire Red Shorthorns should be accepted as eligible for entry in Class 146, for Dairy Cows, in milk, of "the Shorthorn, Ayrshire, or other pure breeds." A resolution from the Warwickshire Chamber of Agriculture, asking the Society to permit a limited butter-making competition at the Birmingham Meeting of pupils of the Warwickshire or other local school, had been considered, and the Secretary had been instructed to reply that the Council were unable to alter the decision which had already been arrived at with regard to this matter. Various questions arising out of the entries in the dairy classes had been discussed and settled, and it had been decided that the entries of certain exhibitors, who could not state particulars of the breeding of their dairy cows entered in Class 148, could not be accepted for entry in that class, and that they be informed that the intention of this class was the exhibition of animals whose breeding the public could ascertain from the catalogue.

Retiring Members of Council.

The SECRETARY submitted, in compliance with Bye-law 23 (*c*), the list of the twenty-four members of Council retiring by rotation, but eligible for re-election at the general meeting to be held on Monday the 23rd instant. He also reported the nomination, under the same bye-law, of Mr. Victor Cavendish M.P., proposed by Sir Nigel Kingscote, seconded by the Hon. Cecil Parker, for the vacancy on the Council caused by the retirement of the Duke of Devonshire.

Official Market Prices of Meat.

Mr. ALBERT PELL moved the following resolution, of which he had given notice: "That the Council are of opinion that the Government should collect and publish in an official form the market prices of meat as they do of corn" He said it was just ten years since he moved an exactly similar resolution to that which he now submitted. It was said that everything came to him who waited, and he hoped, therefore, that he might now have better fortune in seeing what he desired carried out by the Government. Ten years ago there were not the opportunities of giving effect to this resolution—which was then carried by an unanimous vote of the Council of the Royal Agricultural Society—that

there were to day. Nothing came of that resolution, which was relegated to the Board of Trade. Now they had a Board of Agriculture, and he trusted and hoped that if the Council to-day re-affirmed this resolution, some effect might be given to it. His reasons for moving it had been much strengthened by official reports to the Government. Two Royal Commissions had dealt with this question. The Royal Commission on Market Rights and Tolls decided "that it is desirable to collect statistics of market prices of commodities through the agency of market owners as far as may be possible," and "that it is desirable to collect statistics of the market prices of meat." (*Vol. xi, p.* 120.) These decisions were recently confirmed in the final report presented in June, 1897, of the Royal Commissioners on Agricultural Depression. The Commissioners also said:—

> The evidence submitted by the Board of Agriculture shows that the returns of prices of this class now received by that Department are far from complete or satisfactory, and we agree that better means should be afforded the Board of collecting information as to the current prices of meat, cattle, dairy, and other agricultural produce, by means of correspondents at the more important market centres It is not anticipated that any very large expenditure would thereby be involved, or that any difficulty would be incurred in giving effect to this proposal (*p.* 149).

Major Craigie's Report to the President of the Board of Agriculture dated April 20th, 1897, published with the Agricultural Returns of 1896, stated (page 34):—

> No average prices of meat or of other agricultural produce are obtained on any general system which can give anything like equal value to those officially published in the case of grain. But in the absence of better data it has been customary to quote the nominal range of prices at certain markets, collected from a variety of unofficial observations.

It was strange that the only statistics—which were unofficial—were compiled (as was stated in the Agricultural Returns) in the case of Liverpool from information furnished by the Liverpool Medical Officer of Health; in the case of Glasgow by the Principal of the Veterinary College; and in London from the quotations in an agricultural newspaper. There was something very incongruous in introducing the services of medical and veterinary professional men in connection with the prices of meat. On a review of the whole of the circumstances, it seemed to him that it was not out of place that the Society should ask for some better returns. There was really a lesson to be learned from such results as had been published. They showed that the prices of the best quality of meat in England had only dropped about 10 per cent. during the last quinquennial period (1891–95), whereas the prices of inferior meat had dropped about 35 per cent. Therefore agriculturists and graziers would see how desirable was, and what a stimulus was given to the production of the best article. He did not want the Government to collect the proposed statistics exactly in the same way as corn. That would require an Act of Parliament. All he hoped was that the Board of Agriculture would send certain inquirers to *bonâ fide* markets in England without the intervention of an Act of Parliament.

Mr. S. P. Foster seconded the resolution, which was carried unanimously and ordered to be transmitted to the President of the Board of Agriculture.

Country Meeting of 1901.

On the motion of Sir Jacob Wilson, seconded by Sir John Thorold, it was resolved that the Country Meeting for the year 1901 should be held at some town in District F, consisting of the counties of Gloucester, Hereford, Monmouth, Salop, Stafford, Warwick, Worcester, and of South Wales, it having been settled that the Country Meeting of 1899 should be held at Maidstone (District D), and of 1900 at York (District E).

Date of Next Meeting.

Various letters and other documents having been laid upon the table, and the report of the Council to the General Meeting to be held on May 23, 1898, having been prepared, the Council adjourned until Wednesday, May 25, 1898, at 10.30 a.m.

WEDNESDAY, MAY 25, 1898.

EARL SPENCER, K.G. (PRESIDENT), IN THE CHAIR.

Present:

Trustees.—H.R.H. the Duke of York, K.G., Earl Egerton of Tatton, Sir Walter Gilbey, Bart., Colonel Sir Nigel Kingscote, K.C.B., the Duke of Richmond and Gordon, K.G.

Vice-Presidents. — The Earl of Feversham, the Right Hon. Sir Massey Lopes, Bart., Lord Moreton, the Earl of Ravensworth, Sir John Thorold, Bart.

Other Members of Council.—Mr. Alfred Ashworth, Lord Brougham and Vaux, Mr. F. S. W. Cornwallis, M.P., Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. A. E. W. Darby, the Earl of Derby, K G., Mr. J. Marshall Dugdale, Mr. W. Frankish, Mr. James Hornsby, the Earl of Jersey, G.C.M.G., Capt. W. S. B. Levett, Mr. Henry D. Marshall, Mr. Joseph Martin, Mr. T. H. Miller, Mr. P. A. Muntz, M.P., the Hon. C. T. Parker, Mr. A. E. Pease, M.P., Mr. Albert Pell, Mr. Frederick Reynard, Mr. S. Rowlandson, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. A. J. Smith, Mr. E. W. Stanyforth, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Sir Jacob Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. R. S. Burgess, Superintendent of the Showyard.

Mr. H. A. Wiggin and Mr. W. H. Lythall, as representatives of the Local Committee, attended the General Birmingham Committee on Monday, May 23.

Apologies for non-attendance were received from the Duke of Bedford, the Earl of Cawdor, Mr. H. Chandos-Pole-Gell, Mr. C. S. Mainwaring, Mr. Dan. Pidgeon, Mr. J. E. Ransome, Mr. Henry Smith, Mr. Richard Stratton, Mr. J. P. Terry, Mr. Charles Whitehead, and Professor J. B. Simonds.

The minutes of the last meeting of the Council, held on May 4, having been taken as read and confirmed, the election of the following Governor and forty-seven Members was proceeded with:—

Governor.

PARKER, The Hon. Cecil T...Eccleston, Chester.

Members.

ARBLASTER, W. G...Manstey Farm, Penkridge, Staffs.
ASTLE, A...Walton-on-Trent.
BRAMWELL, H...Crown East Court, Worcester.
BRITCH, E...Appleton Thorn, Warrington.
BRUNTON, Hon. T...Melbourne, Victoria.
CADDICK, E. W...Caradoc, Ross, Hereford.
CALTHORPE, Lt.-Gen. the Hon. Somerset.. Perry Hall, Birmingham.
CASH, T...Brockhill Farm, Redditch.
CATTELL, F...Erdington, Birmingham.
CAUTLEY, H. L...All Souls' Vic., Cheriton.
CAVE-BROWNE-CAVE, R...Barton Ct., Malvern.
CLARKE, E...Austrey, Atherstone.
CLARKE, W. J...Cogenhoe, Northampton.
COATS, Peter..Whitney Court, Hereford.
EARDLEY, R. V...Colehurst Manor, Market Drayton.
FIELD, W., M.P...Blackrock, co. Dublin.
*FRASER, Samuel..Agricultural and Horticultural School, Holmes Chapel, Cheshire.
GUILLE, Rev. H. G. de C. Stevens..Little Torrington, Devon.
*HACKING, T...Durham College of Science, Newcastle-on-T.
HARDIMAN, H...Swan Hotel, Burford, Tenbury.
HELLABY, T. R...Shustoke Hall, Coleshill.
HOUSE, J...King's Cliffe, Wansford.
KEYSER, C. E...Aldermaston Court, Reading.
LAMBERT, G. H...Tan-y-graig, Pentraeth, Anglesey.
LEAROYD, Major C. D., R.E...Beacon Grange, Hexham.
*LESLIE, John..The University, Edinburgh.
LEONARD, W. J. H...14 [illegible] Avenue, Gateshead.
LONSDALE, Capt. H. H. Heywood..Shavington, Market Drayton.
LONSDALE, Mrs. Heywood..Cloverley, Whitchurch, Salop.
MCGRATH, James..Bosvigo Farm, Truro.
MACKENZIE, Capt. C. G...Foxton Grange, Market Harborough.
MONCKTON, J. H...Meriden, Coventry.
OLIVER, Godfrey R...Kisinvurthy Estate, Santaveri, Birur, Mysore, India.
*PEET, J. O...The University, Edinburgh.
*RACKHAM, S...Agricultural Coll., Aspatria.
RICKARDS, C. A...Bell Busk, Leeds.
SARTORIS, A. H...Weekley, Kettering.
SCHOFIELD, Capt. H. N...Foxton Grange, Market Harborough.
SECKHAM, Guy L. T...Whittington Old Hall, Lichfield.

* Life member by examination.

SOWERBUTTS, H. R...Highfield, Ashton-on-Ribble.
STANTON, A. J...11 Musgrove Road, New Cross, S.E.
TAYLOR, A. H...Market Hall Ho., Birmingham.
THOMPSON, C. W...Gledstone Estate Office, Skipton-in-Craven, Yorks.
VERNON, John B...Hales, Market Drayton.
WAINWRIGHT, T. T...21 Leigh St., Liverpool.
WARREN, C. L...Tabley House, Knutsford.
WOOTTON, J...Standeford, Wolverhampton.

The reports of the various Standing Committees were received and adopted as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the period ended May 21, 1898, as certified by the Society's Accountants, had been laid upon the table and approved. The receipts during that period were 844*l*. 8*s*. 8*d*., and the expenditure was 3,281*l*. 5*s*. The balance at the bank, allowing for cheques outstanding, was 1,963*l*. 4*s* 4*d*. Accounts amounting in all to 8,971*l*. 11*s*. 1*d*. had been passed and were recommended for payment.

House.

Sir NIGEL KINGSCOTE (Chairman) reported that Sir Walter Gilbey had presented to the Society a set of six valuable prints of Hanover Square in past days.

On the motion of the PRESIDENT. the cordial thanks of the Council were voted to Sir Walter Gilbey for this acceptable gift.

Journal.

Sir JOHN THOROLD (Chairman) reported that, in reply to an inquiry from the Meteorological Office, it had been decided to nominate Mr. Garrett Taylor, of Trowse House, Norwich, as the recipient of the Hay Harvest Forecasts in East Anglia, in the room of the late Mr. W. Birkbeck, of Thorpe, Norwich.

Chemical and Woburn.

Mr WARREN reported that a valuation of the wheat and barley crops at Woburn had been made. The Committee considered that the points brought out by this valuation were most interesting, and they had instructed the Consulting Chemist to prepare a note upon the subject for publication in the September Journal. Instructions had also been given for the preparation for the Journal of a report on the Feeding Experiments with bullocks and sheep, which had been conducted during the past winter. Arrangements had been made for the annual inspection by the Committee of the Woburn Experiments on June 8 next.

The Committee called attention to the fact that under the name "Maize Germ," were sold occasionally materials which, though the products of maize, were not really the germ. The skin or husk of maize was sometimes sold as "Maize Germ," and though costing as much as 4*l*. 10*s*. per ton was not nearly as suitable a food for dairy cattle as the true "Maize Germ."

Botanical and Zoological.

Mr. WHEELER reported the receipt of a letter as to the injurious effects of the plant meadow saffron (*Colchicum autumnale*), from a member of the Society, with whom the Consulting Botanist had also been in correspondence. The Committee desired to point out that this subject was dealt with in the Consulting Botanist's last annual report in the Journal, vol. viii., 1897, page 742. The Committee recommended that copies be printed of the Schedule of Wild Birds beneficial to Agriculture, which was drawn up by the Zoologist in 1895, and that they be distributed as occasion required by the Zoologist and from the Society's offices.

The Consulting Botanist had presented the following report:—

Report of Consulting Botanist.

Forty-four inquiries from members of the Society have been dealt with since the last report. Seventeen of these referred to the quality of grass seeds, and 15 of clover seeds.

A case of injury to a field of beans was investigated, and found to be caused by a severe attack of *Uromyces Fabæ*, which had so destroyed the leaves that they withered and fell off, and consequently any hope of a crop was destroyed.

Hand pulling of the leaves of colchicum was recommended in a pasture which it was undesirable to break up and fallow. The fruit comes to the surface with the leaves, and should be removed at the same time so as to prevent new plants from appearing. The colchicum, deprived of its leaves, is unable to lay up food in the corm for the production of the flower and seed, and the plant is exhausted and dies.

The presence of *Nardus stricta*, a hard mountain grass rejected by stock, in a piece of ground enclosed from a hill pasture, may be got rid of by paring the turf and burning it.

The active life of vegetation during the past month seems to have carried the clover crops through the serious injury caused by the attack of the *Sclerotinia*. Where the plants had not been completely destroyed by the fungus, a new and vigorous growth of shoots from the crown of the root has been produced, which appear to be free from the parasite. No case of active injury has been observed during the month.

(Signed) WILLIAM CARRUTHERS.

May 23, 1898.

Veterinary.

The Hon. CECIL PARKER (Chairman) reported that a letter had been received with reference to mortalities amongst sheep and cattle on a farm near Bristol, and that this matter was receiving attention at the Royal Veterinary College, Professor Penberthy having paid a visit to the farm on Monday last. The Committee had discussed the steps to be taken with regard to the Society's exhibition of pigs at the Birmingham Meeting, in view of the Board of Agriculture's recent Order, dated May 13th, 1898, entitled the Swine Fever (Movement) Order, No. 5795. It was agreed that application should be made to the Board for a licence to hold an exhibition of pigs under Section 11 of this Order, and it was arranged that any questions which might arise in connection with this matter should be left for settlement by the Chairman. Seventy-three entries had been received for the horse-shoeing competitions at the Birmingham Meeting—viz., thirty-eight entries in Class I. (Hunters) and thirty-five entries in Class II. (Dray horses)—and it had been arranged that the competition should commence at 9 a.m. each day as last year.

The following report had been presented by Professor McFadyean:—

PLEURO-PNEUMONIA AND FOOT-AND-MOUTH DISEASE.—No case of either of these diseases has been reported during the last three weeks.

ANTHRAX.—During the three weeks ended May 14, 45 outbreaks, with 53 animals attacked, were reported. The total outbreaks for the first twenty weeks of the current year number 245, as against 194 in the corresponding period of 1897.

GLANDERS.—There were 39 outbreaks, with 87 animals attacked, during the three weeks ended May 14. The total number of outbreaks notified during the first twenty weeks of this year is 294, being 36 fewer than in the corresponding period of last year.

RABIES.—One case of this disease (in the county of Buckingham) was notified during the current month. The total number of cases for the first twenty weeks of this year is 10, all of which were in dogs, as against 74 cases in dogs and 10 in other animals in the same period of 1897.

SWINE FEVER.—The outbreaks for the last three weeks officially notified were 86, 53, and 72 respectively, being an increase of 29 outbreaks, as compared with the corresponding period of last year. The total outbreaks for the first twenty weeks of this year number 1,045, as against 1,184 in the same period of last year.

INVESTIGATIONS AT ROYAL VETERINARY COLLEGE.—The number of morbid specimens sent to the Research Laboratory for examination during the present month was 20, including cases of swine fever, anthrax, tuberculosis, pyæmia, tumours, &c.

Stock Prizes.

Mr. SANDAY (Chairman) reported that the Board of Agriculture had issued a new Order, entitled the Swine Fever (Movement) Order of 1898, prohibiting the movement without a permit of swine along the highways or thoroughfares, in "Swine Movement districts," from a market, fair, sale, or exhibition, licensed under the Order. The Secretary had interviewed the officials of the Board of Agriculture on this matter, pointing out to them that the Society's Birmingham Meeting was to be held next month in one of the scheduled districts subject to the Swine Fever (Movement) Order of 1898. The Committee, having given careful consideration to the matter, had resolved to recommend that no exception be made to the regulations governing the arrival of stock in the showyard, and that pigs be not admitted until Friday, June 17th. The Committee further recommended that an application for a licence should be made to the Board of Agriculture.

Judges' Selection.

Mr. SANDAY (Chairman) reported that owing to the large number of entries (112) in the Cider classes, the Committee recommended the appointment of a second judge, Mr. J. F. Hayes, of Glastonbury.

Implement.

Mr. FRANKISH (Chairman) reported that arrangements had been made for the trials of self-moving vehicles, to commence on Monday, June 13th, at 9 a.m., in the showyard at Four Oaks

Park, when the arrangements as to the loads to be carried and other details would be determined, and a preliminary run over a short distance be given to each of the vehicles. On the following morning (Tuesday) the vehicles would be started on a run of twenty-five miles out and twenty-five miles return to Four Oaks, and any further trials that might be necessary would be carried out on Wednesday, June 15th.

General Birmingham

MR. RYLAND reported that the programme for the Birmingham Meeting had been discussed and finally settled, and the Committee recommended that it should be issued as soon as possible. Various applications from breed societies for permission to hold meetings in the large tent had been granted on the usual conditions, and the following time table of the meetings had been settled :—

Monday, June 20, 1898.

Shropshire Sheep Breeders' Association	3.0 p.m.

Tuesday, June 21, 1898.

National Sheep Breeders' Association (Council) . . .	10.30 a.m.
Polo Pony Society . . .	11.0 a.m.
Royal Agricultural Society of England	12.30 p.m.
Shire Horse Society (Council) .	2.0 p.m.
Shorthorn Society . . .	2.30 p.m.
National Pig Breeders' Association	3.0 p.m.
Kerry and Dexter Cattle Society	[illegible] p.m.
Cotswold Sheep Society . .	4.0 p.m.

Wednesday, June 22, 1898.

Hackney Horse Society (Council)	11.0 a.m.
Breeders of Large Black Pigs .	12.0 noon
Hunters' Improvement Society (Council)	2.0 p.m.

MR. RYLAND added that he might mention, for the guidance of members, that Four Oaks Station, on the London and North-Western Railway, was the nearest to the showyard, and that the cab fare from that station had been fixed at 1*s*. The cab fare from the other three stations, at Sutton Coldfield and Sutton Park, had been fixed at 1*s*. 6*d*. He might also mention that Sutton Park, which was the nearest station on the Midland Railway, was only suitable for foot passengers, and that vehicles would have to go round by Sutton Coldfield. Anybody, therefore, going to the Show with luggage would do well to alight at the Sutton Town station.

Showyard Works.

SIR JACOB WILSON (Chairman) reported that the erection of the shedding in the implement yard of the Birmingham Meeting was completed, and that the grand stand and the horse and cattle shedding were almost finished. The work of laying in water-pipes was being pushed forward, and about three-fourths of the mains had been placed in position. The refreshment pavilions were in course of erection. A deputation from the Maidstone Local Committee, consisting of the Mayor of Maidstone (Mr. Alderman Joseph Barker), Sir Marcus Samuel, the Town Clerk of Maidstone (Mr. S. Lance Monckton), Mr. R. Hamilton Seymour, and Mr G. P Mitchell Innes, had attended the Committee, and explained in detail their proposals with regard to the water supply for the Maidstone Meeting of 1899. The Local Committee explained that they had reason to believe that the supply of water for the showyard would be satisfactorily arranged for by the Town Water Company. But in any case they would be prepared to guarantee that the supply of water on the ground would be ample for all requirements; as, in the event of the company not being able to undertake the supply, the Local Committee had made arrangements for the lease of Park Spring, from which they could obtain 3,000 gallons per hour or 60,000 gallons of water per diem. The Society's Consulting Engineer had examined the spring, and was of opinion that if the Local Committee could guarantee a daily supply of 60,000 gallons, with a storage of 300,000 gallons, the Society would be in a safe position as regards the supply of water for the requirements of the showyard. The Committee, therefore, recommended that the Maidstone Local Committee be requested to forward at once a written undertaking embodying the above proposals, and engaging, in the event of the Park Spring Scheme being adopted, that a notification to this effect should be given to the Society by January 1st, 1899, and guarantee-

ing that a storage of 300,000 gallons of water would be ready for use by the Society on May 1st, 1899.

Selection.

Sir JOHN THOROLD (Chairman) brought up the following resolutions, which the Committee recommended for the adoption of the Council:—

1. That this Council, having received an intimation from the Hon. Cecil Parker that, owing to the increasing calls upon his time, he does not propose to offer himself for re-election as Honorary Director, desires to place on record its high appreciation of the valuable services rendered during the last six years by Mr. Parker as Honorary Director of the Country Meetings of the Society.

2. That the Hon. Cecil Parker be elected a Life Governor, and that he be requested to accept from the Society a piece of plate of the value of 100*l.* in grateful recognition of the services rendered by him.

3. That the above resolutions be engrossed upon vellum and sealed with the seal of the Society, and that they be presented with the plate to Mr. Parker at the General Meeting of governors and members to be held in the Birmingham Showyard on Tuesday, June 21, next.

H.R.H. the Duke of YORK, in moving the adoption of these resolutions said: As President of the Society last year, when we had one of the most successful shows in the annals of the Society, and certainly one of the most difficult to manage in view of the exceptional circumstances of the year and the unprecedented attendance of the public, I should like to be permitted to propose for the approval of the Council the resolutions which Sir John Thorold has just read. Everyone who has served, as I have, the office of President must be aware how very much of the success of the shows depends upon the Honorary Director, and we are fortunate in having had during the last six years so able and so devoted a Director as Mr. Parker. We regret, though we cannot be surprised at, his wish to retire from the onerous duties attaching to the position. He carries with him in his retirement the grateful thanks of the Council and of all those associated with the shows, whether as members, exhibitors, or visitors, and of these thanks the souvenir and address which we offer for the acceptance of Mr. Parker are the outward expression. I have great pleasure in moving the resolutions.

Sir JOHN THOROLD seconded the resolutions, and said he believed that it was in accordance with the wish of all the Members of Council that they should be adopted. He was afraid that they were asking Mr. Parker to undertake rather an arduous task, in having this presentation made to him at the general meeting in the showyard; but he felt sure that the assemblage there of exhibitors and members would only wish to join with the Council in expressing to Mr. Parker their hearty recognition of his services in connection with the shows.

The resolutions having been carried by acclamation,

The Hon. CECIL PARKER, in reply, said he had in the first instance to thank His Royal Highness for the far too kind way in which he had mentioned his services, and the Council for the resolutions which they had so unanimously passed, honouring him far more than his services demanded or deserved. He knew six years ago that his task was very difficult, as he had to try to follow one whose knowledge, experience, and abilities stamped him as a master of the position. However, he determined to do his duty to the Society, and to try to merit the confidence the Council had reposed in him. The resolutions made him hope and feel that he had not altogether been unsuccessful, but he did not attribute the success to his own personal skill and ability, but to a combination of various circumstances. First, he had the support and encouragement of every Member of Council; secondly, he had been able to get together a very able body of Stewards and Assistant Stewards, whose work at the shows contributed very much to their success; thirdly, he had to thank the large body of exhibitors for their forbearance and courtesy to him at all times, especially under the trying circumstances of last year. He was perfectly aware that his *modus operandi* had not always given satisfaction, but he would ask them to believe that he had been actuated solely by a desire to benefit the Society. He had also to thank the Secretary and his excellent staff for helping him in the way they had. He was afraid he had often tried

their patience very severely, but he hoped there was left a small stock on which his successor might rely. As to Sir Ernest Clarke, whose energy and resources were, as they knew, unbounded, he could only say that during the six years of his office they had never had a single difference of opinion. Another source of gratification to him was that for the five shows of which he had had charge, the fates had been propitious; and on each occasion he had been able to hand over a balance of funds—sometimes more and sometimes less—to his friend, Sir Nigel Kingscote, as Chairman of the Finance Committee. He assured them that he felt more than his poor words could express, and he would say simply but most sincerely that he thanked them. (Cheers.)

On the motion of Sir JOHN THOROLD, Mr. E. W. Stanyforth was nominated as Steward of Forage for the York Meeting of 1900; and on the motion of the Hon. CECIL PARKER, seconded by Mr. SANDAY, Mr. E. V. V. Wheeler was appointed as an additional Steward for the forthcoming Birmingham Meeting.

Education.

Mr. DUGDALE reported that for the Society's examination in the science and practice of agriculture, held from the 10th to the 14th of this month, 48 candidates entered, of whom 42 competed. The Committee presented their detailed report upon the Examination (see page 377).

Dairy.

Mr. CRUTCHLEY (Chairman) reported that the programme of demonstrations in the dairy had been finally settled as printed in the draft programme of the Birmingham Meeting, and that directions had been given with regard to the table poultry classes for next year's show.

"Queen Victoria Gifts" for the year 1898.

The PRESIDENT, on behalf of the Trustees of the Queen Victoria Gifts Fund, reported that the sum of 250*l.* would be available for distribution this year to unsuccessful candidates at the elections of the Royal Agricultural Benevolent Institution.

Miscellaneous.

On the motion of the PRESIDENT, formal authority was given for the affixing of the Society's seal (1) to the foregoing resolutions on the subject of the Honorary Director's impending resignation, and (2) to the agreement with the Corporation of York for the holding of the Society's Country Meeting of 1900.

Date of Next Meeting.

The date of the next ordinary monthly meeting of the Council was fixed for June 21st, at noon, in the Birmingham Showyard, and the Council then adjourned.

Proceedings at Anniversary Meeting of Governors and Members,

HELD AT THE SOCIETY'S HOUSE, 13 HANOVER SQUARE, LONDON, W.

MONDAY, MAY 23, 1898.

EARL SPENCER, K.G. (PRESIDENT), IN THE CHAIR.

THE Anniversary General Meeting of the Governors and Members of the Royal Agricultural Society of England was held at the Society's House, 13 Hanover Square, W., on Monday, May 23rd, 1898, at noon, Earl Spencer, K.G. (President), in the chair.

Present:

Trustees.—Earl Egerton of Tatton, Sir Walter Gilbey, Bart., Col Sir Nigel Kingscote, K.C.B., the Duke of Westminster, K.G.

Vice-Presidents.—The Right Hon. Sir Massey Lopes, Bart., Lord Moreton, the Earl of Ravensworth, Sir John H. Thorold, Bart.

Other Members of Council.—Mr. John H. Arkwright, Mr. F. S. W. Cornwallis, M P., the Earl of Coventry, Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, the Earl of Derby, K.G., Mr. J. Marshall Dugdale, Mr. W. Frankish, the Marquis of Granby, Mr. James Hornsby, Mr. Henry D. Marshall, Mr. Joseph Martin, Mr. P. Albert Muntz, M.P., the Hon. Cecil T. Parker, Mr. Albert Pell, Mr. Frederick Reynard, Mr. S. Rowlandson, Mr. Howard P. Ryland, Mr. Alfred J. Smith, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. Martin J. Sutton, and Sir Jacob Wilson.

Governors.—The Right Hon. W. H. Long, M.P., Mr. C. R. Moorsom-Mitchinson-Maude, Mr. Leopold Salomons.

Members.—Lord Harlech, the Right Hon. Sir R. H. Paget, Bart., M.P., Sir J. R. Heron-Maxwell, Bart., Professor Sir George Brown, C.B., Messrs. A. W. Arkwright, Wm. Barford, Frank Bradshaw, George J. Brown, A. C. Cope, F. S. Courtney, C.E., H. S. Daine, T. A. Dickson, John Downing, Captain E. P. Elmhirst, Messrs. B. S. Essex, C. E. Galbraith, A. M. Gordon, H. J. Greenwood, Surgeon Lieut.-Col. John Ince, M.D., Messrs. Cecil S. Joy, Frederick King, R. M. Knowles, W. H. Lythall, W. McCracken, J. R. Markby, R. Jasper More, M.P., Ralph Palmer, P. P. Pennant, Capt. E. G. Pretyman, R.A., M.P., Messrs. Clare Sewell Read, R. Henry Rew, G. F. Sheppard, Frank Silvester, Arthur H. Sykes, W. J. Thody, Edward Trimen, Capt. G. G. Wells, Messrs. J. O. Whatley, Frederick Wrench, &c.

Officers.—Sir Ernest Clarke (Secretary); Dr. J. Augustus Voelcker (Consulting Chemist).

The SECRETARY having read the Bye-Laws governing the transaction of business at the anniversary general meetings,

Election of President for 1898–99.

Mr. CLARE SEWELL READ said he had very great pleasure in moving that the Earl of Coventry be elected President of the Society for the ensuing year. He was quite sure that every member present and every member of the Royal Agricultural Society would consider that in Lord Coventry they had been able to find a very suitable and fitting President for the ensuing year.

Mr. RALPH PALMER having seconded the motion,

The PRESIDENT, in putting it to the meeting, observed that he had nothing to add to what had been said as to the

admirable qualifications of his friend Lord Coventry for filling this office, and he trusted that he would have a successful year.

The motion having been carried unanimously,

The Earl of COVENTRY returned his very hearty thanks for the honour conferred upon him in electing him as President of the Society. He would endeavour to discharge the duties to the best of his ability, hoping that he might count upon their assistance and support during his term of office (Cheers)

Re-election of Trustees and Vice-Presidents.

The PRESIDENT said that before they proceeded with the re-election of the Trustees and Vice-Presidents he wished to say a few words on this subject from the Chair. They had received a letter in the office from one of the oldest of their Trustees, Sir Thomas Acland, who wrote that, owing to failing health and inability to leave his home, he wished not to be re-elected. Sir Thomas Acland was one of the oldest members of the Society. He became a member at the first general meeting of the Society, which was held when his (Lord Spencer's) uncle was in the chair. That was sixty years ago. Since then Sir Thomas Acland had been for twenty-three years a Trustee, and his father was before him for thirty-three years a Trustee of the Society. Under the circumstances, therefore, he thought that the meeting would hardly desire to break this connection, which had existed from the first formation of the Society, with the name of Acland. (Hear, hear.) They found themselves with this remarkable fact before them—that among their office-bearers they had three who had been sixty years in the Society: Sir Thomas Acland, to whom he had referred; his noble friend the Duke of Richmond (who was elected a member of the Society only a few weeks after Sir Thomas Acland); and Professor Simonds, who still remained Honorary Consulting Veterinary Surgeon to the Society. The fact was a remarkable one, and was worthy of note on that occasion. He therefore suggested that they should make no change with regard to Sir Thomas Acland, but re-elect him as one of their Trustees.[1]

The Trustees and the Vice-Presidents were then re-elected by show of hands.

Election of Council.

The election of twenty-five Members of Council was proceeded with, and the President appointed Mr. Hubert J. Greenwood, Mr. W. H. Lythall, and Mr. R. Henry Rew to act as scrutineers of the voting papers. These having been duly collected, and the report of the scrutineers thereon received, it was announced that the twenty-four Members of Council who retired by rotation had been re-elected, together with Mr. Victor C. W. Cavendish, M P., of Holker Hall, Lancashire.

Report of Council.

The SECRETARY then read an abstract from the Report of the Council to the Meeting. (See p. 371.)

Sir JOHN HERON-MAXWELL moved the adoption of the report, and congratulated the members upon its satisfactory character. He hoped, however, that there would before long be an increase in the number of members. He was sure that, with a show in the centre of England, they would be able to induce a large number of others to join the Society. He was very glad to see also in the report a decision which he thought would be approved by all the members of the Society, and that was the proposed appointment of a paid official in charge of the showyard. He thought that was a step in the right direction. He was also glad to see that the stringent measures connected with the muzzling of dogs had been of the greatest value in the decrease of rabies throughout the country.

Mr. MOORSOM-MAUDE seconded the motion for the adoption of the report, which was then carried unanimously.

Vote of Congratulation to the Secretary.

In response to the usual inquiry from the Chair as to whether any

[1] Sir Thomas Acland died on May 29, 1898, on the sixtieth anniversary of his election as a member of the Society.

Governor or member had any remarks to make, or suggestions to offer, that might be referred to the Council for consideration,

Surgeon Lieut.-Col. INCH moved a vote of congratulation to the Secretary on the honour which had been conferred upon him. He was sure it must be a subject of great congratulation to every member of the Society, because they knew that an honour to their officers was reflected upon themselves.

Mr. FRANK SILVESTER having seconded the motion,

The PRESIDENT said that this matter had not been overlooked by the Council, and he had referred to it at the Council meeting immediately after the honour had been conferred. Having worked during his year of office with Sir Ernest Clarke, he entirely endorsed the views expressed by the proposer of the motion, and he heartily joined with the Society in congratulating Sir Ernest Clarke on the honour conferred upon him.

The motion was then unanimously adopted.

Sir ERNEST CLARKE, in returning thanks for the resolution, said that he accepted with the deepest gratitude the good will of the members of the Society, and he could only say that it had been his earnest endeavour to meet as far as possible all the wishes of the members. They would recognise, of course, that it was impossible to please everybody. There was a very old fable which taught them that; but the Executive of the Society was sincerely anxious to help members, and to give them all possible information. It was a matter of the highest gratification to him that Her Majesty should have been pleased, through the honour conferred upon him, to pay such a high compliment to that great, noble, and historic Society.

Vote of Thanks to Chairman.

The Right Hon. WALTER LONG, M.P., said that, by virtue of the position which he had the honour to occupy for the time being, he was entrusted with the moving of the next resolution—viz., a hearty vote of thanks to Lord Spencer for his services during the past year. Perhaps they would allow him also to express his personal thanks as the President of the Board of Agriculture to the President, officers, and members of the Royal Agricultural Society, for the very valuable support which they had consistently given in the difficult and extremely unpopular work of combating the diseases of animals throughout the country. Every member knew that it was essential in the highest and best interests of agriculture that the health of stock of all kinds in this country should be brought to as complete a state of perfection as it was possible for human skill and energy to bring about. At the same time there was a large section of the community who, while sharing those views, were extremely unwilling to see them put into practice in any method other than the one which commended itself to them personally. There was a considerable section who admitted it was both desirable and essential that disease should be exterminated, but who went on to say that not only did they disapprove of the methods employed by the Department, but that if the Department would accept their methods and adopt their system of procedure extermination of disease would be brought about much more quickly than at present. He was not concerned in defending the position of the Department. After all, the heads of the Department came and went, and the credit of the work done was due to the skill of the eminent men who formed the permanent officials of the Department. He did not say on their behalf or on that of the Department that everything that it did should be accepted as the best possible thing that could be done; but he was entitled to ask that their critics should judge them by the light of past experience as thrown upon the practice of the Department in connection with the extermination of disease. He ventured to say that the most casual examination of this question would show anybody that the position which Great Britain enjoyed to-day was one of which they might well be proud, and which must be of considerable advantage and benefit to those engaged in agriculture. If

they would take the trouble to compare the condition of Great Britain in regard to the diseases of animals with that of any other country in the world, he ventured to say they would not be quite so ready to criticise those men who had spent laborious days in their efforts on behalf of the interests of this great industry. Although there was more disease than many of them would like to see in this country, its condition compared with what it was twenty-five or thirty years ago reflected the highest possible credit on those responsible for the measures which had brought about this result. (Cheers.) Therefore he hoped they would be criticised not only by the light of the intelligence of those who would like to do their work for them, but also by the experience of past results. (Hear, hear.)

He asked them to vote unanimously and enthusiastically the thanks of that great and historic Society to Lord Spencer for the way in which he had acted as President during the sixtieth year of its existence, and he would point to the fact that the first name at the commencement of those sixty years was the name of the President who appeared at the end of the sixty years—a happy coincidence, upon which they might well congratulate themselves. It was difficult in Lord Spencer's presence to say why they found him to be so eminently qualified to fill his position. If he were absent it would be easy to point to his life, which was known to many of them, and was followed by admiration and gratitude, and to prove, if it were necessary, that he had offered an example which might well be followed by others who desired to fill the position of an English country gentleman to the advantage of the community and their own lasting individual credit. They had never had anyone who more thoroughly enjoyed the confidence of this Society, and he begged to move a hearty vote of thanks to Lord Spencer for his services in the chair.

The Right Hon. Sir R. H. Paget, M.P., in seconding the motion, said it was always pleasing to undertake an easy task, and his task was of the easiest. He ventured to assure his Lordship of the high esteem in which he was held by the members of the Society, who desired to express to him their hearty thanks for the able services which he had rendered to the Society and to the world of agriculture during the past year.

The motion was then put by the Secretary and carried unanimously.

The President, in reply, said he wished to thank with the greatest possible cordiality his right honourable friends for the way in which they had proposed and seconded this resolution. He was afraid that they had exaggerated what he had done as President of the Society. All he could say was that he had been deeply interested in the work of the Royal Agricultural Society, and though his official business in another country had taken him away from the Council Chamber and the Committee Rooms of the Society, he had been glad to be able, in the position of President, to again renew his acquaintance with the admirable work which was performed in that house. He thought it was right sometimes, for the sake of the public, to refer to the great work which the Society undertook, independently of its useful shows which were most in the eye of the public. What he believed to be of even greater value was the work that the Society did in its various Committees on chemistry, on veterinary science, and other departments. Their value could not be overrated, and not the least benefit to the agricultural education of this country was that admirable publication, the Journal of the Society.

He desired to refer to one or two matters connected with his year of office as President. The Society had had considerable difficulties during the past year, which had been surmounted successfully. One of these was in consequence of that terrible visitation of sickness at Maidstone. They had settled to visit Maidstone this year, but that had to be given up. He ventured to think, however, that they were very fortunate in being able to secure so splendid a place for the annual show as that near Birmingham, situated as it was not only in the midst of a large agricultural district, but of an immense population, which would no doubt

greatly benefit by coming to the show. He sincerely trusted that when next year's show was held at Maidstone, it would be eminently successful.

His right honourable friend had alluded to one very important matter. He (the President) had exercised in another country the supreme control over agriculture; and before the Board of Agriculture was established he had had the honour of being President of the Council, in which capacity he had had an immense deal to do with regard to the checking of foot-and-mouth disease and pleuro-pneumonia. He rather thought that he was one of the first Ministers who ever stopped a shipload of diseased animals from coming to England, and he remembered very well the commotion they made when they ordered the detention of a ship from France, where foot-and-mouth disease was raging. In Ireland, where the agricultural interest was predominant, where there was an enormous trade between that country and this, and where, as some of them might realise, it was not easier to conduct affairs than in England, he had had to contend with persons of great eminence in trying to enforce in Ireland the same rules as in England. He wished to endorse absolutely what his right honourable friend said as to the great importance of putting trust in those who had full knowledge and who had had experience in other countries as well as in this country as to the best methods of dealing with these insidious enemies to agricultural prosperity. He always endeavoured to support the decisions of the head of the Agricultural Department, whoever he might be, and he had no doubt that the Society would always support what the Department did—at all events as long as the management of that Department was conducted on sensible and sound principles.

He hoped they would excuse his referring to another matter which was of considerable interest and importance to agriculturists in this country. H.R.H. the Prince of Wales intimated the other day that he wished on some occasion to refer to the importance of the coming Exhibition at Paris in the year 1900. He had no doubt that His Royal Highness would desire to ask the assistance of all agriculturists in the endeavour to have a representation from this country as good as it could be. Owing to the position he held as President of this Society, he had the honour to be President of the Committee of the Royal Commission which included Agriculture. They had very great difficulties with regard to this matter, and he might tell them what they were. They had a vast system of agriculture in this country, but they had a very small space indeed where they could have exhibits at the Paris Exhibition. They were very anxious to make the best display, which might be of benefit to this country by stimulating the desire to purchase agricultural machinery, and to teach other countries what they could show in the way of successful agriculture. A great many invitations had been sent to exhibitors asking them to send exhibits, and he should be very happy, as Chairman of this Committee, to confer with any agricultural gentlemen who might be desirous or willing to help in this matter of the proper representation of England at Paris in 1900. Perhaps at the Birmingham Meeting they might be able to get together gatherings of those who represented the different branches of agriculture, as it was necessary for the names of intending exhibitors to be sent in next August. In conclusion, he thanked them extremely for their kindness in passing this resolution, and he also desired to express his thanks for the support given to him by the permanent officials and the members of the Society generally during his year of office.

The proceedings then terminated.

MEMORANDA.

ADDRESS OF LETTERS.—All letters on the general business of the Society should be addressed to "The SECRETARY, Royal Agricultural Society of England, 13 Hanover Square, London, W." Letters addressed to officials of the Society by name are liable to be delayed.

TELEGRAMS.—The Society's registered address for telegrams is "Practice, London." *Replies by Telegraph cannot be sent unless paid for in advance, and cannot be guaranteed in any case.*

TELEPHONE NUMBER, 3675, "Gerrard."

OFFICE HOURS.—10 to 4. On Saturdays, 10 to 2.

GENERAL MEETINGS in London: Thursday, December 8, 1898, and Monday, May 22, 1899, at noon, at the Society's house, 13 Hanover Square, W.

MONTHLY COUNCIL (for transaction of business), at noon on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

ADJOURNMENTS.—The Council adjourn over Passion and Easter weeks, when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

SUBSCRIPTIONS.—1. *Annual.*—The subscription of a Governor is £5, and that of a Member £1 due in advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st of June.

2. *For Life.*—Governors may compound for their subscriptions for future years by paying on election, or at any time thereafter, the sum of £50, and Members by paying £15. Members elected before 1890 may compound at any time on payment of £10 in one sum; and Members elected in or subsequently to 1890 may compound for the same amount after the payment of ten annual subscriptions. Governors and Members who have paid their annual subscription for 20 years or upwards, and whose payments are not in arrear, may compound for future annual subscriptions, that of the current year inclusive, by a single payment of £25 for a Governor, and £5 for a Member. No Governor or Member can be allowed to enter into composition for life until all subscriptions due by him at the time shall have been paid.

No Governor or Member in arrear of his subscription is entitled to any of the privileges of the Society.

All Members belonging to the Society are, under the Bye-laws, bound to pay their annual subscriptions until they shall withdraw from it by notice in writing to the Secretary.

PAYMENTS.—Subscriptions may be paid to the Secretary, either at the office of the Society, No. 13 Hanover Square, London, W., or by means of crossed cheques in favour of the Secretary, or by postal orders, to be obtained at any of the principal post-offices throughout the kingdom, and made payable at the Vere Street Office, London, W. When making remittances it should be stated by whom, and on whose account, they are sent. All Cheques and Postal Orders should be crossed "London and Westminster Bank, St. James's Square Branch."

On application to the Secretary, forms may be obtained for authorising the regular payment, by the bankers of individual members, of each annual subscription as it falls due. Members are particularly invited to avail themselves of these Bankers' orders, in order to save trouble both to themselves and to the Society. When payment is made to the London and Westminster Bank, as the Bankers of the Society, it will be desirable that the Secretary should be advised by letter of such payment, in order that the entry in the bankers' book may be at once identified, and the amount posted to the credit of the proper person. No coin can be remitted by post, unless the letter be registered.

JOURNAL.—The Parts of the Society's Journal are (when the subscription is not in arrear) forwarded by post to Members, or delivered from the Society's Office to Members or to the bearer of their written order.

The back numbers of the Journal are kept constantly on sale by the publisher, Mr. JOHN MURRAY, 50A Albemarle Street, W.

NEW MEMBERS.—Every candidate for admission into the Society must be nominated by a Governor or Member, and must duly fill up and sign an application for Membership on the appointed form. Forms of Proposal may be obtained on application to the Secretary. The Secretary will inform new Members of their election by letter.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

TUESDAY, JUNE 21, 1898.

(IN THE BIRMINGHAM SHOWYARD.)

EARL SPENCER, K.G. (PRESIDENT), IN THE CHAIR.

Present:

Trustees.—Earl Egerton of Tatton, Colonel Sir Nigel Kingscote, K.C.B.

Vice-President.—Sir John Thorold, Bart.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. George Blake, Mr. J. Bowen-Jones, Mr. Victor C. W. Cavendish, M.P., the Earl of Coventry, Mr. F. S. W. Cornwallis, M.P., Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, the Earl of Derby, K.G., Mr. A. E. W. Darby, Mr. J. Marshall Dugdale, Mr. S. P. Foster, Mr. W. Frankish, Mr. James Hornsby, Capt. W. S. B. Levett, Mr. C. S. Mainwaring, Mr. Henry D. Marshall, Mr. T. H. Miller, Mr. P. Albert Muntz, M.P., the Hon. Cecil T. Parker, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. C. C. Rogers, Mr. S. Rowlandson, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. A. J. Smith, Mr. E. W. Stanyforth, Mr. R. Stratton, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. E. V. V. Wheeler, Sir Jacob Wilson.

Officers.—Sir Ernest Clarke, Secretary: Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. Cecil Warburton, Zoologist.

Death of Sir Thomas Dyke Acland.

The PRESIDENT said that on the occasion of the Anniversary General Meeting it had been decided to retain the name of Sir Thomas Acland on the list of the Society's Trustees. He regretted to say that within a few days of that time Sir Thomas Acland died. As they were all aware, he had lived to be a very great age. He was one of the founders of the Society in conjunction with his (the President's) uncle, the third Lord Spencer, Mr. Philip Pusey, and Sir Harry Verney, since whose death Sir Thomas Acland had been the "Father" of the Society. In his day he did most useful work for agriculture, and he (the President) was sure that they would all deplore his death. From beginning to end he had been sixty years a member of their Society, and they would all regret the loss of one who had been so long attached to the Royal Agricultural Society of England.

Election of New Governor and Members.

The minutes of the last monthly meeting of the Council, held on May 25, 1898, having been taken as read and approved, the election of the following new Governor and forty-six new Members was proceeded with:—

Governor.

EXETER, the Marquis of.. Burghley House, Stamford.

Members.

ALSTON, C. W... 18 Upper Brook St., Oswestry.
ATKIN, John.. Bonehill, Tamworth.
BARRATT, H... Betchton, Scholar Green, Ches.
CASSON, T.. R. A. College, Cirencester.
CRETNEY, J... Ballanard, Isle of Man.
CRIDLAN, J. J... 14 Bishop's Road, W.
DUTTON, T.. Styche Farm, Mkt. Drayton.

EDNEY, J. P... West Tytherley, Salisbury.
FIRTH, T. J... Stainton Woodhouse, Rotherham.
FRENCH, W. W... Hillside, Amwell, Herts.
GAUNT, J... Wispington Ho., Horncastle.
GILES, D... Station St., Bromsgrove.
GODMAN, H... R. A. College, Cirencester.
GRAYSON, J... Worsbro, Barnsley.
*GREEN, J. J... 16 Bank St., Darwen.
HELLICAR, Nigel G... Micheldever.
HIGSON, H... Hampton Lucy, Warwick.
HOPE, J. L. A... Whitney Ct., Herefordshire.
HORNE, C. C... Clifford, Hereford.
HUMPHREYS, A. E. O... Glansevern, Berriew, Mont.
HUMPHERY, M. G... Drayton, Tamworth.
LAWRENCE, L... Mucklestone, Mkt. Drayton.
LOWCOCK, S. R... 35 Waterloo St., Birmingham.
MEREDITH, R. L... Woundale Farm, Bridgnorth.
MILLER, A. M. B... Hatton Asylum, Warwick.
MINSHALL, T... Moreton Saye, Mkt. Drayton.
MOOKERJEE, J. N... Koolinpara, Sukchar, India.
MORRIS, Geo... Silverdale, Staffs.
MOTION, A. R... Upton House, Banbury.
MUCKLOW, C. D... R. A. College, Cirencester.
NORCLIFFE, T... Langton Hall, Malton.
PEARSE, T... Alberton Manor, Pershore.
PILKINGTON, F. C... Idsall House, Shifnal.
POWELL, J... Moorcroft, Colwall, Malvern.
POYNTING, Prof. J. H... Foxhill, Alvechurch.
ROBERTSON, A... Woodside Ter., Douglas, I.M.
SHANNON, E. J... Dumcrieff, Sutton Coldfield.
SIMON, T., jun., Market Drayton.
TAYLOR, J. W... Moreton, Whalley, Lancs.
THOMSON, T... The Sands, Shifnal.
TODD, R. F... Blythewood, Edgbaston.
WALMISLEY, A. T... 9 Victoria Street, S.W.
WATSON, F... Sundridge, Sevenoaks.
WHITE, M. W. M... Selborne, Evesham.
WOOD, A. H. E... Sudbourn Hall, Wickham Market.
WOOD, F... Rayton Farm, Worksop.

* Reinstated under Bye-law 12.

New Member of Council.

Sir JOHN THOROLD, as Chairman of the Committee of Selection, formally introduced Mr. Victor C. W. Cavendish, M.P., who was elected a Member of Council at the General Meeting on May 23, 1898, and who now attended for the first time.

Report of Finance Committee.

Sir NIGEL KINGSCOTE (Chairman) reported that accounts connected with the Birmingham Meeting, amounting in all to 4,695*l.* 13*s.* 7*d.*, had been passed, and were recommended for payment.

He also reported from the Special Committee that thirty-two applications had been received for the post of Assistant Director. The Committee had held three meetings, the last on the 9th instant, and had interviewed six selected candidates. The Committee were unanimous in recommending the appointment of Mr. J. E. Compton-Bracebridge, who, they had every reason to believe, was in every way fitted for the post. This recommendation had been endorsed by the Finance Committee.

Mr. STRATTON said he was bound to express his strong opinion that the salary of 700*l.* a year was excessive for the duties required of a gentleman in this position. He thought that 400*l.* a year would be ample, and he was quite sure that this was the opinion of those outside the Council.

Sir NIGEL KINGSCOTE and the Hon. CECIL PARKER pointed out that the question of remuneration had been before the Council on two occasions, and had already been settled.

The PRESIDENT agreed that it was now too late for any motion to be made upon this subject, though he would have been quite ready, if necessary, to say a few words in support of the recommendation of the Special Committee.

The Report of the Finance Committee was then unanimously adopted, and Mr. J. E. Compton-Bracebridge was formally appointed Assistant Director at a remuneration of 700*l.* per annum.

Points arising out of the Show.

The Hon. CECIL PARKER gave notice that at the November meeting of the Council he would move that the judging of the poultry be in future on the Saturday. He would not go into the reasons for this change now, but the judging of the produce on the Saturday had answered very well. He wished to bring the matter forward in November, so that the Members of the Council might have time to consider it. Another point would require the earnest consideration of the Council. It was only at recent shows that the practice of moving heavy vehicles in the showyard by traction engines had come into vogue; and it was impossible to get the showyard into order with these engines working about the yard. Anyone could see the very deep ruts which such engines made in the showyard, and which it was impossible to prevent. The Showyard Works Committee would have to take up this matter, with perhaps the

assistance of the Implement Committee.

Votes of Thanks in Connection with the Birmingham Meeting.

On the motion of the Hon. CECIL PARKER (Honorary Director), seconded by Sir JACOB WILSON, it was unanimously resolved:—

That the best thanks of the Society are due, and are hereby tendered to—(*a*) Lloyds Bank Ltd., for the efficient assistance rendered by them during the Birmingham Meeting; (*b*) to the Warwickshire Constabulary, for the efficient assistance rendered by them in connection with the Birmingham Meeting; (*c*) to the St. John's Ambulance Association, for the efficiency of the ambulance arrangements in the Showyard during the Birmingham Meeting; (*d*) to Messrs. Chamberlain, King, and Jones, Ltd., of Birmingham, for furnishing the Royal apartments in Four Oaks Hall; (*e*) to Messrs. Edward Webb and Sons, of Stourbridge, for providing the floral decorations around Four Oaks Hall, the members' pavilion, &c.; (*f*) to Messrs. Merryweather and Sons, Ltd., of Greenwich Road, for the provision of fire-engines, and for their efficient arrangements in connection with the fire-station in the Showyard; (*g*) to the officials of the Birmingham Post Office for the efficient postal and telegraphic arrangements.

On the motion of the Hon. CECIL PARKER (Honorary Director), seconded by Sir JACOB WILSON, it was also unanimously resolved:—

That a letter be addressed to the Chief Commissioner of Police, after the conclusion of the Meeting, conveying the appreciation of the Council of the very efficient services rendered by the detachment of the A Division of the Metropolitan Police at the Birmingham Meeting.

Letters of thanks were also ordered to be addressed to various local and other firms who had rendered assistance in connection with the Meeting.

Ventilation of Cow Byres.

A letter having been received from Mr. E. G. Wheler, of Alnwick, with reference to a test case as to cubic air space in cow byres,

Mr. ASHWORTH said that this matter was becoming increasingly serious, and he thought that what Mr. Wheler wanted was an expression of opinion from the Council and a representation to the Local Government Board on the subject, that would emphasise the importance of this matter.

Earl EGERTON OF TATTON referred to the report from the Royal Commission on Tuberculosis, which he said was satisfactory so far as it went, inasmuch as it drew a distinction between "populous" and "non-populous" places. He thought, however, that it did not draw that distinction with sufficient clearness. There might be non-populous places within the area of large boroughs which might include some purely agricultural districts, and he ventured to hope that the report of the Commission would be read with the understanding that where such conditions existed these districts would be considered as non-populous places. Of course, in crowded streets a larger amount of ventilation was required in the byres.

The PRESIDENT said that he took a considerable interest in this matter, and had taken part in the previous discussions upon it. No doubt it was a very important thing that this distinction should be maintained. As Lord Egerton had said, there might be a little doubt upon the matter, for the report was not quite clear; but he was glad to notice in the report that the Commissioners made a decided distinction between byres in towns where the cows never moved out at all, and byres in the country where they were continuously out, and where the circumstances were altogether different. He thought the Council had a strong opinion that something might be done in getting a test case decided, but he hardly thought that the Society should appear in a case by counsel, because now they knew that there was nothing that the Local Government Board had done which bound local authorities. The sympathy of the Council would be with those who desired to test the matter, but he did not think that the Society should take an active part in prosecuting such a case itself.

Mr. GARRETT TAYLOR thought that if the Society should decide to take an active part in this matter, it should first of all be thoroughly threshed out by the Veterinary Committee.

Mr. Wheler's letter was then formally referred to the Veterinary Committee for consideration and report to the Council at their next meeting.

Miscellaneous

A protest against the prize awarded to an animal in the Hackney classes, on the ground that it exceeded fifteen hands and was therefore ineligible for its class, was not sustained, as the Veterinary Inspector had certified that the height of the animal was exactly fifteen hands.

A report was received from the Consulting Botanist as to his investigation of the cause of mortalities among sheep and cattle on a farm in Gloucestershire, in which he expressed the opinion that such mortalities were due to the active poison in a plant to which the animals had access in the pastures, known as the dropwort or water hemlock (*Œnanthe crocata*, Linn.). This report was referred to the Botanical and Zoological Committee (see page 561).

The Council then adjourned until twelve noon on Wednesday, July 27, 1898, at 13 Hanover Square.

SPECIAL MEETINGS OF THE COUNCIL,

HELD IN THE SHOWYARD AT THE BIRMINGHAM MEETING.

Special meetings of the Council were held in the Showyard at the Birmingham Meeting, on Monday, June 20, Thursday, June 23, and Friday, June 24, 1898, Earl Spencer, K G, President, in the Chair.

MONDAY, JUNE 20, 1898.

The proceedings had reference to matters of detail in the administration of the Showyard. It was decided that no recommendations of third prizes should be accepted by the Stewards from the Judges in Classes where only two prizes were offered in the prize-sheet

THURSDAY, JUNE 23, 1898.

The HONORARY DIRECTOR read the following telegram, which he had received that morning from H.R.H. the Prince of Wales:—"Delighted to hear of such a magnificent attendance at Show. All the arrangements were admirable. I was much pleased with my visit. (Signed) ALBERT EDWARD."

With reference to the complaint made by Mr. Robert Hussey at the General Meeting, that all the Hackneys and ponies were not measured on entering the Showyard, in accordance with regulation 51 of the Stock Prize Sheet, Sir GEORGE BROWN explained that it was not necessary to put all the animals under the measuring standard, but that in all cases where there was the least doubt the measuring standard was used. The question of the future wording of this regulation was referred to the Stock Prizes Committee.

Sir GEORGE BROWN presented a report upon the Veterinary inspection of the horses at the Birmingham Meeting, under regulations 48–50 of the Prize-Sheet. The report stated that of 149 stallions and brood mares which were inspected on Monday, June 20, 142 were passed as free from indications of hereditary disease. Of the seven rejected animals, four were affected with whistling and roaring; one was affected with cataract; one with unsound feet; and one with spavin. Of the twenty-three Polo pony stallions and brood mares inspected on Tuesday, June 21, twenty of the animals were passed as free from indications of hereditary disease. Of the three rejected animals, one was affected with cataract; one with ringbone; and one with spavin. The whole result of the Veterinary inspection might be considered as highly satisfactory.

FRIDAY, JUNE 24, 1898.

The Hon. CECIL PARKER (Honorary Director) said he had a real pleasure in asking the Council to pass a special vote of thanks to Mr. Howard P. Ryland for his exertions, first of all in obtaining the site of the Showyard for the Society; for the very efficient manner in which he had carried out his duties as Steward of Forage; and for his kind hospitality in receiving the Stewards of Implements and Finance as his guests during the Show-week and during the trials of Self-moving Vehicles. He begged to move that a hearty vote of thanks be given to Mr. Ryland for all he had done in connection with the Birmingham Meeting.

Mr. SANDAY (Steward of Implements) seconded the motion, and said that no member could have done more for the Society than Mr. Ryland had done. Speaking personally, he could say that his kindness and hospitality had been unbounded. They could not, in fact, thank him enough for all that he had done.

Mr. ROWLANDSON (Steward of Finance) supported the motion, saying that he could confirm every word of the two previous speakers.

The PRESIDENT, in putting the motion, said he was glad to add his small mite to the praise and thanks given to Mr. Ryland. He had witnessed the exertions he had made to promote the interests of the Society, not only in the Showyard, but in a great many other ways.

The motion having been carried by acclamation,

Mr. RYLAND, in reply, said he had but done his duty in the interests of the Society, and the work had given him great pleasure.

The Hon. CECIL PARKER (Honorary Director) also said that this being the last time that he would have the opportunity of controlling Mr. Burgess's work as Superintendent of the Showyard, he wished to congratulate him on the very efficient way in which he had performed his duties. The work had been carried on in the smoothest way possible, without fuss or trouble. He congratulated Mr. Burgess upon his first appearance in the Society's service. Next year he would be in a better position, because this year everything had been new to him.

Mr. BURGESS expressed his grateful acknowledgments of the compliment paid to him by the Honorary Director.

Sir GEORGE BROWN presented a report, certifying that none of the animals exhibited any signs of contagious or infectious disease, and that no outbreak of such disease had occurred during the time of the show.

Various questions arising out of the Birmingham Meeting having been referred to Committees for consideration and report, the Council adjourned until Wednesday, July 27, 1898, at 13 Hanover Square, W.

WEDNESDAY, JULY 27, 1898.

THE EARL OF COVENTRY (PRESIDENT) IN THE CHAIR.

Present:

Trustees.—General Viscount Bridport, G.C.B., Colonel Sir Nigel Kingscote, K.C.B., Sir A. K. Macdonald, Bart., Earl Spencer, K.G.

Vice-Presidents.—Mr. H. Chandos-Pole-Gell, the Right Hon. Sir Massey Lopes, Bart., Lord Moreton. Sir John Thorold, Bart.

Other Members of Council.—Mr. J. H. Arkwright, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. Victor C. W. Cavendish, M.P., Mr. F. S. W. Cornwallis, M.P., Mr. Percy E. Crutchley, Mr. J. Marshall Dugdale, Capt. W. S. B. Levett, Mr. Henry D. Marshall, Mr. T. H. Miller, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. C. C. Rogers, Mr. G. H. Sanday, Mr. A. J. Smith, Mr. E. W. Stanyforth, Mr. Martin J. Sutton, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. C. W. Wilson, Sir Jacob Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. Cecil Warburton, Zoologist; Mr. J. E. Compton-Bracebridge, Assistant Director; Mr. R. S. Burgess, Superintendent of the Showyard.

Professor Sir George Brown, C.B.

The following members of the Maidstone Local Committee were also present: — Mr. Herbert Monckton (Town Clerk) and Mr. R. A. Hamilton Seymour (Local Secretary).

Apologies for non-attendance were received from the Earl of Cawdor, the Hon. Cecil T. Parker, Mr. Alfred Ashworth, Mr. J. Bowen-Jones, Lieut.-Col. J. F. Curtis-Hayward, Mr. Alfred Darby, Mr. W. Frankish, Mr. James Hornsby, Mr. C. S. Mainwaring, Mr. Dan. Pidgeon, Mr. S. Rowlandson, Mr. Henry Smith, Mr. Charles Whitehead, and Professor J. B. Simonds; also from the Mayor of Maidstone and Mr. S. Lance Monckton.

Election of New Members.

The minutes of the last ordinary meeting of the Council, held on June 21, 1898, were approved, and those of the special Council meetings held on June 20, 23, and 24, 1898, were read and confirmed.

The election of the following fifty-two members was then proceeded with:—

ARMSTRONG, F...George Hotel, Penrith.
BIRD, John B...Hampton Lucy, Warwick.
BOND, E...Corporation St., Birmingham.
BROCK, J...Gwern Tyno, Colwyn Bay.
BROWN, A...Knightley Eaves, Eccleshall.
CAPELL, R. N...Gold St., Northampton.
CLARKE, J. R...Broomfield, Reddish, Lancs.
CLEGG, H. G...High Legh, Knutsford.
DONALDSON, J...Pangbourne, Berks.
ENGLAND, H. J... 83 Wilkinson Sq., Sheffield.
FAIR, J. St. F...Wilderton, Bournemouth.
FIRTH, E. W...Tapton Edge, Sheffield.
FISH, F. E...Kirby Grindalythe, Wharram, Yorks.
FOLLOWS, W...Frankley, Birmingham.
FOWLER, R. H...Rahinston, Enfield, co. Meath.
GOOCH, L. S...Bovingdon, Hemel Hempstead.
GOOCH, T. S...Bovingdon, Hemel Hempstead.
GRAY, F. J. S...Little Aston Hall, Sutton Coldfield.
GREATREX, A. C...Ashfurlong Hall, Sutton Coldfield.
HEAVISIDE, Capt. G. H., Eaton Ho., Norwich.
HIRST, C. A...Crake Hall, Allerston Marshes, Pickering.
HOFIGAARD, E. A...13 Clifton Gardens, W.
HOOPER, W. D...31 Cambridge Road, Brighton.
HOYLE, J. S...Bassfield, Bury, Lancs.
JEFFERY, C. G...R. A. College, Cirencester.
JENKS, J...Penn Moor, Wolverhampton.
KNIGHT, J. G...Newcastle-under-Lyme.
LANE, A. E. C...King's Bromley Manor, Lichfield.
LEWIS, C. L...Castle Eaton, Fairford.
LLOYD, A. H. O...Leaton Knolls, Shrewsbury.
MANN, T. H...Hyde Hall, Sawbridgeworth.
MOODY, Commander T. B., R.N...Whitmead, Tilford, Farnham.
NEWSOME, J. E...Wellfield, Dewsbury.
NORDENFELT, T...Stockholm.
NORMAN, W. H...Union Street, Liverpool.
QUIBELL, T. O...The Grove, Newark.
REBBECK, J...Kingston Lisle, Wantage.
RUSTON, J. S...Monk's Manor, Lincoln.
SELD, T...Bashall Town, Clitheroe.
SMITH, Sydney...Marshome, Stottesdon, Cleobury Mortimer.
SMYTH, Lieut.-Colonel E. G. Selby...Darby House, Sunbury-on-Thames.
TAYLOR, M. C. H...Shelsley Walsh, Worcester.
THOMPSON, P. B...Cottenham Ho., Wimbledon.
TURNER, G. M...Abbey Hill, Kenilworth.
WATERER, A...Knapp Hill, Woking.
WHITE, Lieut.-Col. F. A...Burghley House, Stamford.

WIGRAM, R. S... Oakfield, Kirkstall, Leeds.
WILKINSON, W... Ashley House, Handsworth Wood.
WILLIAMS, C. J... Lightbody St., Liverpool.
WILLIAMS, J. L... Newton Ho., Tattenhall, Chester.
WILLIAMS, W. G... Burton-on-Trent.
WORRALL, R. J... Byrom Street, Liverpool.

The reports of the various Standing Committees were then presented and adopted, as below:—

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the period ended June 30, 1898, as certified by the Society's Accountants, showed total receipts amounting to 5,082*l.* 11*s.* 3*d.*, and expenditure amounting to 10,451*l.* 15*s.* 5*d.* The accounts for the period ended July 27, 1898, showed receipts amounting to 11,505*l.* 11*s.* 3*d.*, and expenditure amounting to 6,612*l.* 6*s.* 3*d.*

Accounts relating to the Birmingham Meeting, amounting in all to 10,951*l.* 18*s.* 7*d.*, and relating to the ordinary business of the Society, amounting to 3,566*l.* 19*s.* 3*d.*, had been passed, and were recommended for payment. The quarterly statement of subscriptions, arrears, and property as at June 30, 1898, was laid upon the table In view of the unsatisfactory result of the Birmingham Meeting, the Committee were under the necessity of asking the Council to sanction the sale of 5,000*l.* of the Society's invested funds.

Sir NIGEL KINGSCOTE, in presenting the report of the Committee, said that he appeared that day in the disagreeable position for a Chairman of the Finance Committee of having to ask the Council to sanction the sale of 5,000*l.* Consols, which was nearly a third of the Society's funds invested in Government securities. It must not, of course, be assumed that this was all actual loss arising from the Birmingham Meeting, though he feared that when the balance for the recent Show was struck there would be found to be an unpleasantly large deficit. Recently, as the Council would remember, they established, at a cost of some 1,100*l.* for buildings, a pot-culture station at their Experimental Farm at Woburn, and the Society had also bought a stock of waterpipes for use at the Birmingham and future Shows. The bills for these and other items of capital expenditure had been temporarily discharged out of their current balances; and they were encouraged to hope that the result of their Meeting last month in the populous Midlands would have been an accession to those balances, instead of, as had unhappily proved the case, a serious depletion of them. The uncertain weather might have had something to do with the diminished attendance, but the very unsatisfactory manner in which the passenger traffic was managed on the London and North-Western system from Birmingham to Four Oaks Station and back undoubtedly deterred many thousands of persons from visiting the Show, and was chiefly responsible for the miserably small attendance of 13,739 on the second shilling day. He hoped it would not escape the attention of the Council in the future that their shows had now grown so large, with the immense increase in the entries and the multiplicity of departments, that receipts at the gates from non-members which formerly—and not so long ago—would have been sufficient to yield a satisfactory profit, were now quite inadequate to meet their expenditure. He felt that with the yearly increasing difficulty of finding sites for their extensive Showyard of 100 acres in the immediate vicinity of populous places, they ought to direct their attention to the problem of making the shows more independent than they were at present of the receipts from visitors, which were affected, as they had painful experience at Birmingham, by many circumstances beyond the control of the Society—breakdowns of railway administrations, uncertain weather, and the like. As it seemed impossible to set limits to the growth of the shows, they would have, he was afraid, shortly to consider whether they should not ask exhibitors to assume, by increased fees for space and entries, a larger share of the financial responsibility of the undertaking than had heretofore been the case.

Earl SPENCER said he was sure the Council would much regret the necessity for their having to sell out a portion of their capital in Consols in

order to provide for the probable deficit of the Birmingham Meeting. As he was President the whole of that time he should like to say a few words on the subject. The Council would agree with him that, as far as the Show itself went, it was as good a show as it could possibly be, not only with regard to the live stock, but also the implements and everything exhibited in the showyard. With respect to the deficit, he quite agreed with what Sir Nigel had stated as to the necessity of their considering the means of making both ends meet more independently of the gate money. A great deal depended upon the railway arrangements. They had been led to believe that the railway would be able to bring all the people up to Four Oaks. The moral was that they must not depend entirely upon the railways if they wanted a large attendance at the shows. He remembered hearing that on one occasion people were kept waiting at the station from the time the showyard closed until half-past eleven, and on the Thursday there were an enormous number of people who could not be brought to Four Oaks at all. He therefore thoroughly endorsed what the Chairman of the Finance Committee had stated as to the necessity of looking into the whole matter—not only with regard to the receipts, but also the expenditure—in order that they might improve their financial position in connection with these great shows.

The PRESIDENT said that the suggestions made by Sir Nigel Kingscote and supported by Lord Spencer would doubtless receive the attention of the various Committees concerned after the autumn recess.

On the motion of Sir NIGEL KINGSCOTE, seconded by Mr. SANDAY, the seal of the Society was then formally ordered to be affixed to a power of attorney for the sale of 5,000*l.* Consols, as recommended by the Finance Committee.

On the motion of Sir NIGEL KINGSCOTE, it was resolved:—

That in view of the desirableness of winding up as early as possible the accounts for the Birmingham Meeting, authority be given to the President, the Chairman of the Finance Committee, and the Secretary, to issue, during the recess, orders upon the Society's Bankers for the payment of accounts connected with the show.

House.

Sir NIGEL KINGSCOTE (Chairman) reported that, in view of the periodical cleaning and of the rearrangement of the books, the Committee recommended that the Members' Reading Room and the Library be closed during September for such period as might prove necessary. Various accounts connected with the house had been passed for payment.

Journal.

Sir JOHN THOROLD (Chairman) laid upon the table copies of the June Journal, and stated that the Society was indebted to Sir John Lawes and Sir Henry Gilbert for their valuable contribution to this number on "The Growth of Sugar Beet, and the Manufacture of Sugar in the United Kingdom." The Committee recommended that the article on "The Mare and Foal" be reprinted at once as one of the Society's pamphlets, at the price of 1*s.* per copy. The Editor's proposals as to the contents of the September number of the Journal had been considered and approved.

Chemical and Woburn.

Mr. WARREN reported that the Consulting Botanist has visited all the sites now under observation for grass experiments, that the Consulting Chemist had visited some of the plots, and that he would inspect them all later on in the year. The annual inspection of the Society's Experimental Farm had taken place on June 8 last. Members of the Society of Public Analysts had also visited the Farm, as well as students from the Bedfordshire County Council Farm School.

The Consulting Chemist had presented the following report:—

Report of Consulting Chemist.

LINSEED MEAL.—In the report of the Consulting Chemist for April, 1898, attention was drawn to the sale, under the name

"linseed meal," of ground linseed cake instead of the seed itself merely ground into meal, and still containing all the oil of the original seed, whilst in linseed cake this oil has, to a large extent, been expressed.

It may now be mentioned that several instances of the sale of this "ground linseed cake" under the misleading name "linseed meal" formed on June 2 the subject of prosecutions by the Corporation of Dublin, penalties being inflicted in each case, and a warning being given that much heavier fines would be imposed in the future.

RUSSIAN LINSEED CAKE.—Mention was made in the report for May, 1898, of Russian linseed cakes containing excess of sand as well as weed seeds. In a more recent instance a member sent for analysis a sample which he described as "linseed cake," but which turned out, on closer inquiry, to have been bought merely as "Russian cake." On analysis it gave:—Sand, 4·09 per cent. There having been no guarantee, no claim could be made.

VARIATION OF QUALITY IN THE DELIVERY OF CAKES.—Not unfrequently it happens that in making up a delivery of cakes the whole is not uniform in character, but made up of cakes of differing quality. From this cause it may happen likewise that different reports may be received from chemists who have examined the cakes, according as the sample sent is from one lot or another. A sample of Russian linseed cake was sent to me in April last, forming part of a delivery of cake costing 7*l.* 15*s.* per ton, which had been guaranteed to be of 95 per cent. purity, and to contain over 12 per cent. of oil. My analysis showed:—Oil, 10·77 per cent.; sand, 2·40 per cent.; and my report stated that the cake was not pure, and contained a quantity of spurry as well as other weed seeds. Thereupon another sample was mutually drawn and sent to another chemist, who reported:—Oil, 11·17 per cent.; sand, 1·07 per cent. Finding this, I sent a portion of the sample originally submitted to me to the other chemist, who then informed me that he found in it 2½ per cent. of sand and also weed seeds. From this it was very clear that the delivery must have consisted of a "mixed" lot of cake. In the end a reduction of 10*s.* per ton was made to the purchaser, the vendors allowing that the lots got mixed in the warehouse.

COMPOUND CAKE.—A member sent in June a sample of what was supposed to be half linseed cake (95 per cent. pure) and half decorticated cotton cake, and to show the following guaranteed analysis:—Oil, 9·13 per cent.; nitrogen, 6·30 per cent. My analysis of it gave:—Oil, 8·13 per cent.; nitrogen, 5·34 per cent. Besides being low both in oil and in nitrogen, I reported that the cake was not a nice one, and that it would be much better to get linseed cake and decorticated cotton cake separately and then mix them together. The price of the compound cake was 6*l.* 17*s.* 6*d.* per ton.

DISSOLVED BONES.—Two samples, both purchased as "pure dissolved raw bones," were sent by a member, the one (A) costing 4*l.* 5*s.* per ton, the other (B) 4*l.* 10*s.* per ton. The following analyses will show the marked differences between the two, though the prices were nearly alike:—

	A	B
Moisture	14·96	10·46
*Organic matter ..	23·81	29·97
Monobasic phosphate of lime	11·43	7·79
Equal to "soluble phosphate"	(17·90)	(12·20)
Insoluble phosphates	9·99	25·25
Sulphate of lime, &c.	34·66	24·34
Sand	5·15	2·19
	100·00	100·00
*Containing nitrogen	1·33	2·92
Equal to ammonia	1·62	3·55

The marked superiority of B will be seen from these figures. It was a genuine sample of dissolved bones, while A was not so, being made up with steamed bone and not from raw bone and acid only. The vendor of the inferior sample stated that there "must have been some mistake on his foreman's part," and he agreed to a deduction of 30*s.* per ton being made from the price.

COMPOUND MANURES OF WIDELY DIFFERENT VALUE.—The following analyses show the marked differences that may occur in the value of compound manures offered to the farmer:—

	A	B	C	D
Moisture ..	10·55	15·75	14·70	30·45
*Organic matter	29·60	18·34	19·02	43·11
Monobasic phosphate of lime	8·30	13·82	14·07	·98
Equal to "soluble phosphate" ..	(13·01)	(21·65)	(22·02)	(1·54)
Insoluble phosphates ..	24·82	11·26	7·89	3·35
Sulphate of lime, &c.	30·44	39·94	41·82	11·66
Sand	2·29	·89	2·50	4·45
	100·00	100·00	100·00	100·00
*Containing nitrogen	2·55	1·38	·83	5·47
Equal to ammonia	3·09	1·67	1·00	6·60

A was a sample of "Dissolved Bones," and cost 4*l.* 10*s.* per ton delivered, being not at all dear.

B was sold as "Bone Compound" at 3*l.* 15*s.* 6*d.* per ton delivered, and was also good value.

C was called "Root Manure," and cost 4*l.* 15*s.* per ton, less 5 per cent. discount, being distinctly high priced.

D cost 5*l.* 5*s.* per ton delivered, for cash, and must be considered extremely dear.

(Signed) J. AUGUSTUS VOELCKER.

July 26, 1898.

Botanical and Zoological.

MR. WHEELER reported the receipt of a letter from Professor Eriksson, of the Swedish Academy of Agriculture, with a collection of works on Grain Rust. The Secretary had been instructed to convey the thanks of the Society to Professor Eriksson for his communication, and for his valuable publications on this subject. Mr. Wheeler also reported the completion of the work of the cleaning and remounting of the specimens of

grain collected by the Society fifty years ago, which had been carried out under the kind supervision of Mr. Carruthers. In accordance with their decision of May 3 last, the Committee proposed to make a similar collection of typical specimens of as many as possible of the recognised varieties of grain now cultivated in all parts of the country; and they desired to enlist the co-operation of Members of the Council in the collection of the specimens desired. The Committee recommended that the prizes for Cider and Perry offered at the Maidstone Meeting of 1899 be similar to those given at Birmingham this year, with a slight amendment of the regulations.

The following reports had been presented by the Consulting Botanist and Zoologist respectively:—

Report of Consulting Botanist.

Thirty-five inquiries have been attended to on behalf of the Society since the last report. Two of these referred to the death of stock from eating poisonous plants, which are described in a special note on page 561.

Several cases of destruction of cultivated plants by parasites have been investigated. In Kent, Sussex, and Essex fields of vigorous and healthy beans were attacked by *Uromyces Fabae*, and were completely destroyed. The best thing to be done was to plough the crop in, but care has to be taken not to sow beans in such fields again for some years to come, that is until the abundant crop of spores have germinated, and finding no suitable host to live upon have perished.

A field of barley in Lincolnshire was attacked by a well-known but not very common fungus, *Helminthosporium gramineum*. It is found on the lower leaves, where it forms long, dark brown patches, with somewhat yellow margins. It has not been the cause of serious injury to the crop.

Diseased gooseberries were injured by the attack of the *Aecidium Grossulariae*, a fungus allied to the mildew in wheat which passes its aecidial stage on the barberry. It is believed that the gooseberry fungus has its mildew stage on a sedge, *Carex*. When it occurs on the leaves of the gooseberry it may be easily recognised by the red colour on the upper surface, and the toothed cups with yellowish centre on the under surface. When the young berries are attacked they are distorted and rendered useless as fruit.

Specimens of diseased Iris were found to be attacked by *Helminthosporium gracile*, which caused large margined spots on the leaves. The Brome grasses in a pasture were attacked by a smut (*Ustilago bromivora*), but as this fungus grows only on species of Bromus, all of which are worthless grasses, no harm could come from the destruction of the seeds by this smut.

Many plants in a field of red clover were injured by the appearance of broom-rape (*Orabanche minor*) which lives as a parasite on the roots of the clover. No doubt the seed, which is very small, was brought on the field with the seed of the clover. It is desirable to hand-pull all broom-rapes, putting them as they are pulled into a bag, and then burning them that the light seeds may not be spread about.

Complaints have been made by several correspondents of the abundance of *Genista tinctoria* (dyers' green weed) in pastures. It is believed to be a harmless weed, but when it appears in a pasture it is likely to increase, because of its creeping woody roots, which send up the flowering branches. It is, on this account, very difficult to eradicate.

Twenty-two weeds and grasses have been named and reported upon.

(Signed) WILLIAM CARRUTHERS.

July 26, 1898.

Report of Zoologist.

The applications received by the Zoologist seem to indicate that certain pests, especially leaf-eating caterpillars, have been particularly active this season.

A new treatment for the caterpillar of the goat-moth (*Cossus ligniperda*) has been tried with satisfactory results on a row of young poplar trees. Many of the borings are always so curved or branched that the grub cannot be reached by wire. Into these plugs of cotton wool soaked in strong ammonia solution were inserted, the orifices being then tightly closed by putty. Very little further trouble was experienced.

A case illustrating the importance of carefully examining young bought cabbage plants before planting deserves mention. A consignment of such plants, put in by a member of the Society, soon showed signs of failure. After a few weeks specimens were sent for examination, and were found to be infested by the "cabbage gall weevil" (*Centorrhynchus sulcicollis*). By this time, however, the insect had left the cabbages and entered the ground to pupate. Thus the buyer not only lost the greater part of his crop, but established the pest in his land, and rendered necessary very troublesome measures for its extermination. The presence of the insect is indicated by small swellings or galls on the roots, within each of which may be found a legless, wrinkled white grub. Plants which show any signs of this disease should be at once rejected.

Among the other pests with regard to which advice has been asked may be mentioned the sheep bot-fly, the pine-shoot tortrix, the crane-fly, and the cockchafer.

(Signed) CECIL WARBURTON.

July 26, 1898.

Veterinary.

Sir NIGEL KINGSCOTE reported the recommendation of the Committee that a letter be written to the Local Government Board adverting to the final paragraph of the Board's letter of December 28 last on the subject of cubic air-space in cow byres, and stating that as the Royal Commission on Tuberculosis had now reported, and complaints continued to be received with reference to the restrictive

action of the local authorities, the Council desired to urge the Board to issue without delay model forms of regulations in the sense recommended by the Royal Commission, and thus place this—to agriculturists—highly important question upon a more satisfactory basis.

A report had been received from the judges of horse-shoeing at the Birmingham Meeting recommending Mr. T. H. Fathers, R.S.S., the winner of the first prize in Class I., for the Freedom of the Worshipful Company of Farriers. The Committee recommended that competitions for horse-shoeing be held at the Maidstone Meeting, open to the whole of the United Kingdom, as at the Birmingham and Manchester Meetings.

A letter had been received from the Royal Veterinary College, stating that as the result of the recent examination of candidates for the Society's silver and bronze medals for cattle pathology, Mr. Charles Radway, of Latton Field, Cricklade, had taken the first place, and Mr. Thomas Wolsey, of Shepperton House, Lee Road, S.E., the second place. The Committee therefore recommended that the Society's silver medal be given to Mr. Radway and the bronze medal to Mr. Wolsey.

The following report had been presented by Professor McFadyean:—

SWINE FEVER.—The official returns show that 243 outbreaks of this disease were reported during the four weeks ended July 16, as against 164 outbreaks during the corresponding period of last year. The total outbreaks for the first twenty-nine weeks of 1898 are twenty-four in excess of those for the same period of 1897.

ANTHRAX.—The outbreaks notified for the first twenty-nine weeks of this year number 348, as against 361 in the same period of 1897, and the number of animals attacked during these periods were 533 and 547 respectively.

GLANDERS.—Sixty-one outbreaks were notified during the four weeks ended July 16. The total outbreaks for the current year are 432, as against 492 in the same period of 1897.

RABIES.—Only two cases of rabies have been notified during the last four weeks. During the first twenty-nine weeks of this year fourteen cases have been notified, all in dogs; while in the corresponding period of 1897 there were 101 cases in dogs and twelve in other animals.

MISCELLANEOUS.—During the month of June specimens from thirty-six cases of disease were referred to the Research Laboratory at the Royal Veterinary College for examination, and three local investigations were conducted by officers of the College at the request of members of the Royal Agricultural Society.

On the motion of Sir NIGEL KINGSCOTE, seconded by Sir JOHN THOROLD, Mr. Victor Cavendish, M.P., was added to this Committee.

Cubic Air Space in Cow Byres.

The SECRETARY having read the terms of the letter proposed to be addressed to the Local Government Board, in accordance with the recommendation of the Veterinary Committee,

Earl SPENCER said he could see that this was an extremely important matter for agriculturists, and the Council had had this subject before them on several previous occasions. He thought that the letter proposed to be forwarded to the President of the Local Government Board was drafted in excellent terms, and that it was most important that the Local Government Board should, if possible, issue model rules; because it would be a disastrous thing to agriculturists if in places which were practically in the country, though they might technically be in populous districts, they should be compelled to have these excessive air-spaces for cows. Although such regulations might be necessary in towns, they all knew that they were absolutely unnecessary in rural districts. In such districts the animals had much more air than where the requirements were fulfilled in towns. He therefore hoped that the Local Government Board would fall in with the views which had been so admirably expressed in this letter, and with which he most cordially agreed.

The following letter to the President of the Local Government Board was then formally approved, and ordered to be despatched:—

Royal Agricultural Society of England,
13 Hanover Square, London, W.
July 27, 1898.

CUBIC AIR SPACE IN COW BYRES.

SIR,—It will be in your recollection that a deputation from this Society waited upon you on December 13 last to draw your attention to the present anomalous state of things with regard to regulations made by local sanitary authorities under the Dairy, Cowsheds, and Milkshops Order of 1885, particularly as to the imposition of a

minimum quantity of cubic air space in existing cowsheds in rural districts.

It was suggested by the deputation that in view of the fact that the only documents at present issued which were available for the guidance of local authorities were certain "model" regulations issued by printers without the formal sanction of your Board, though with a measure of Departmental recognition, it was desirable that the Board should themselves issue model forms under the Order of 1885, for the use and guidance of district councils.

In the letter which by your direction Mr. S. B. Provis addressed to this Society on December 28 last, the Board stated that the printers' bye-laws in question "have not been issued with the approval of the Board, who have been in no way concerned in the matter." The Board promised careful attention to the suggestion as to the issue of model forms of their own; but they added:—

"As they understand that the Royal Commission on Tuberculosis have had their attention drawn to the question of air space in cowsheds, and that the Commissioners are now engaged upon their Report, it seems to the Board to be desirable that any action of this kind should be deferred until the Report of the Commission has been issued."

Since that time the Report of the Royal Commission on Tuberculosis has been issued; and on May 5 last the Council communicated to you the following Resolution, which had been unanimously passed by them at their meeting held on May 4:—

"The Council strongly desire to express their concurrence with the recommendations of the Royal Commission on Tuberculosis with regard to the amount of cubic air space in cowsheds, especially with that part of the report which draws a distinction between the requirements in populous and non-populous places, whether technically urban or rural."

As it appears from information which has reached the Society, that in localities which must be regarded as "non-populous," though "technically urban," district councils are seeking to enforce the provision of 800 cubic feet of air space per cow in already existing cow byres, the Council desire me to invite the particular attention of the Local Government Board to the observations made on this point by the Royal Commission on Tuberculosis in recommendations 12 and 13 of their report, and to urge strongly upon the Board the importance of their issuing without delay model forms of regulations which will carry into effect the recommendations of the Royal Commission: so as to place this—to agriculturists—very important question upon a more satisfactory basis than at present.

I am, Sir, your obedient servant,
(Signed) COVENTRY, President.

The Right Honourable
The President of the
Local Government Board.

Recommendations of the Royal Commission on Tuberculosis referred to in the above letter:—

"12. That the conditions of the attached cowsheds that shall warrant the registering of a dairy in a populous place, whether technically urban or rural, in the future shall include the following:—

1. An impervious floor.
2. A sufficient water supply for flushing.
3. Proper drainage.
4. A depot for the manure at a sufficient distance from the byres.
5. A minimum cubic contents as regards such districts of from 600 to 800 feet for each adult beast, varying according to the average weight of the animals.
6. A minimum floor space of 50 feet to each adult beast.
7. Sufficient light and ventilation.

"While we have prescribed a minimum cubic contents and floor space without mentioning definite dimensions affecting ventilation and lighting, we are distinctly of opinion that these are by far the most important, and that requirements as to cubic and floor space are mainly of value as tending to facilitate adequate movement of air.

"Existing cowsheds should be obliged to conform to the prescribed regulations within a period of twelve months from the time of the regulations coming into force.

"13. The same conditions as those recommended for populous places should apply to cowsheds in sparsely populated places, except in so far as cubic contents per cow are concerned; as regards these cubic contents, such space per cow should be provided as would, in view of the surrounding circumstances, secure reasonable ventilation without draught. But the physical circumstances prevailing in different localities being so various, we do not find it practicable to prescribe uniform minimum requirements in this respect."

Stock Prizes.

Mr. SANDAY (Chairman) reported that a printed list of prizes proposed to be offered at the Maidstone Meeting by the Local Committee had been considered, and with some modifications approved. The Committee recommended the immediate publication of the particulars of such of these prizes as related to implements, hops, and preserved fruits, and the issue forthwith of certificates of entry for hops, the entries for which would close on Tuesday, November 1 next.

The following had been appointed a Sub-Committee to prepare a schedule of prizes to be offered by the Society in connection with the Maidstone Meeting, and to report at the meeting of the Committee on Tuesday, November 1, next:—The President (*ex-officio*), the Chairman (Mr. Sanday), the Hon. Cecil Parker, Sir Jacob Wilson, the Hon. Director (Mr. Crutchley), Mr. Garrett Taylor

and Mr. Rowlandson. To this Sub-Committee were referred for consideration various letters received as to the composition of the prize sheet.

Implement.

Mr. STANYFORTH reported the results of the trials of self-moving vehicles and safety appliances for chaff-cutters at the Birmingham Meeting. The question of the prizes to be offered for implements at the York Meeting of 1900 had been discussed, and deferred for further consideration in November. The Committee would be glad to receive before their next meeting any suggestions as to the nature of the trials of implements in connection with the York Meeting.

General Maidstone.

Earl SPENCER reported the Committee's recommendation that the date of the Maidstone Meeting be fixed for Monday, June 19, to Friday, June 23, 1899, the Implement Yard and Dairy being opened on the previous Saturday, June 17. The formal undertaking from the Maidstone Local Committee with regard to the water supply of the Meeting, as arranged at the meeting of the Showyard Works Committee on May 24, had been laid upon the table. Various prizes proposed to be offered by the Local Committee for live stock in connection with the Maidstone Meeting had been discussed. The Committee had finally settled the prizes for Implements, Hops, and Preserved Fruits, as proposed by the Local Committee; and they recommended that the prizes be advertised and the entry forms issued forthwith:—

IMPLEMENTS.

[Entries finally close April 1, 1899.]

Class		Prize £
I.	Machine for washing hops with liquid insecticides, to be worked by horse power or mechanical power	50
II.	*Machine for the evaporation of fruit and vegetables	20
III.	*Best system of packing jams and fruit for travelling:	
	(*a*) For soft fruit	5
	(*b*) For hard fruit	5

* Classes II. and III. are offered by the Maidstone Local Committee.

HOPS.

Class No.		1st prize £	2nd prize £	3rd prize £
A.	Pocket of East Kent hops	20	10	5
B.	Pocket of Mid-Kent hops	20	10	5
C.	Pocket of Weald of Kent hops ..	20	10	5
D	Pocket of Hants or Surrey hops ..	20	10	5
E.	Pocket of Hereford or Worcester hops	20	10	5
F.	Pocket of Sussex hops	20	10	5

PRESERVED FRUITS AND VEGETABLES.

Class No.		1st prize £	2nd prize £
G*	Collection of dried or evaporated fruits	5	3
H*	Collection of dried or evaporated vegetables	5	3
I*	Collection of bottled fruits (whole fruit), to be shown in clear glass bottles ..	5	3
J*	Collection of preserved fruits for dessert purposes, in boxes or other suitable receptacles	5	3
K*	Collection of jams, to be shown in 1 lb. clear glass jars	5	3

* Offered by the Maidstone Local Committee.

The detailed regulations for the above prizes had been settled. The date for the closing of the entries of hops had been fixed for Tuesday, November 1 next, and for preserved fruits and vegetables on Monday, May 15, 1899.

On the motion of Mr. SANDAY, seconded by Mr. WHEELER, it was resolved to offer the following prizes for cider and perry at the Maidstone Meeting:—

CIDER AND PERRY.

	1st prize £	2nd prize £	3rd prize £
Cask of cider, not less than 18 and not more than 30 gallons, made in autumn of 1898	5	3	2
1 Doz. cider made in autumn of 1898	5	3	2
1 Doz. cider made in any year before 1898	5	3	2
1 Doz. perry	5	3	2

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the entrances, pavilions, and nearly the whole of the shedding at Four Oaks Park were now pulled down, and that the permanent plant would soon be removed to Maidstone. The first two sales of timber had

already been held, and had realised satisfactory prices. Two further days' sales of timber would take place on August 10 and 11 next. A report had been received from the St John's Ambulance Association upon the cases dealt with by the Association in the Birmingham showyard, stating that forty-eight persons had received treatment. The cases for the most part were of a slight character, and in only one instance had it been necessary to remove the patient to the hospital.

On the motion of Sir JACOB WILSON, seconded by Mr. SANDAY, Mr. Howard P. Ryland was appointed a permanent member of this Committee, instead of an ex-officio member as Steward of Forage for the Birmingham Meeting.

Selection.

Sir JOHN THOROLD (Chairman) reported the recommendations of the Committee: (1) That Earl Spencer, K.G., be elected a Trustee of the Society in the room of the late Sir Thomas Acland; (2) that to fill the vacancy thus caused in the list of Vice-Presidents, the Duke of Bedford be elected a Vice-President; and (3) that Mr. E. V. V. Wheeler be elected Steward of Dairying for the next three years.

Sir JOHN THOROLD, in moving the formal election of Lord Spencer as a Trustee, thought that the Council would agree with him that they would be extremely fortunate in getting Lord Spencer to undertake this office. He had taken so much interest in the Society, and if he would accept the office they would be very grateful.

The motion having been seconded by Sir NIGEL KINGSCOTE, and carried unanimously,

Lord SPENCER expressed his thanks for the honour paid him, and said he followed a very distinguished agriculturist. Though he might not do so much or remain so long on the Society's list of Trustees as Sir Thomas Acland, he hoped that possibly he might be of some little service to the Society.

Sir JOHN THOROLD then moved the formal election of the Duke of Bedford, saying that he need not remind the Council of the great obligations under which the Society was to his Grace. It was extremely desirable that he should be elected a Vice-President.

Viscount BRIDPORT seconded the motion, which was unanimously adopted.

Education.

Lord MORETON (Chairman) reported the Committee's recommendation that the rule with regard to the payment of deposits in the Examination for Agriculture be altered so as to correspond with regulation 3 of the Dairying Examination which provided that the deposit of £1 should only be returned to those candidates who succeeded in passing the examination. A Sub-Committee, consisting of the Chairman (Lord Moreton), Mr Dugdale, Capt. Levett, and Mr. Sutton, was appointed to consider a number of points in connection with the regulations and syllabus of the Agricultural Examination. The Committee recommended the appointment for five years of Mr. Frederick Reynard as the Society's Representative Governor upon the Drax Schools Foundation. They also recommended that Mr. Crutchley be added to their number.

Dairy.

Mr. CRUTCHLEY (Chairman) presented various accounts for payment in connection with the Dairy at the Birmingham Meeting. A variety of points relating to the past show and to the forthcoming Maidstone Meeting had been discussed.

On the motion of Mr. CRUTCHLEY, Mr Wheeler, as the new Steward of Dairying, was added to the Committee.

Dates of Future Meetings.

The dates for the monthly meetings of the Council to be held during the year 1899 were settled as follows:—February 1, March 1, May 3, May 31, June 20 (Maidstone showyard), July 26, November 1, and December 6. The date of the next General Meeting of the Governors and Members was fixed for Thursday, December 8, 1898. The Council then adjourned over the autumn recess until Wednesday, November 2nd next.

Proceedings at General Meeting of Governors and Members,

HELD IN THE LARGE TENT IN THE SHOWYARD AT

THE BIRMINGHAM MEETING.

TUESDAY, JUNE 21, 1898.

EARL SPENCER, K.G. (PRESIDENT), IN THE CHAIR.

Present on the Platform:

Trustees.—Earl Egerton of Tatton, Sir Walter Gilbey, Bart., Col Sir Nigel Kingscote, K.C.B.

Vice-Presidents.—Mr. H. Chandos-Pole-Gell, the Earl of Feversham, Sir John Thorold, Bart.

Members of Council.—Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. George Blake, Mr. J. Bowen-Jones, Mr. Victor C. W. Cavendish, M.P., Mr. F. S. W. Cornwallis, M.P., the Earl of Coventry, Mr. Percy E. Crutchley, Mr. Alfred Darby, the Earl of Derby, K.G., Mr. J. Marshall Dugdale, Mr. S. P. Foster, Mr. William Frankish, Mr. James Hornsby, Captain W. S. B. Levett, Mr. C. S. Mainwaring, Mr. Henry D. Marshall, Mr. T. H. Miller, Mr. P. Albert Muntz, M.P., the Hon. Cecil T. Parker, Mr. J. E. Ransome, Mr. F. Reynard, Mr. C. C. Rogers, Mr. Samuel Rowlandson, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. W. T. Scarth, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. R. Stratton, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. C. W. Wilson, Sir Jacob Wilson.

Governor.—Mr. C. R. Moorsom-Mitchinson-Maude.

Officers.—Sir Ernest Clarke (Secretary); Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker (Consulting Chemist); Mr. Cecil Warburton, Zoologist.

The Lord Mayor of Birmingham (the Right Hon. C. G Beale), the Mayor of Sutton Coldfield (Mr. A. L. Crockford), and other Members of the Birmingham Local Committee, were also on the platform.

Thanks to the Birmingham Local Committee.

Earl EGERTON of TATTON moved the first resolution, "That the best thanks of the Society are due, and are hereby tendered to the Birmingham Local Committee for their exertions to promote the success of the Meeting." He said it would be in their recollection that, in consequence of the outbreak at Maidstone, the visit of the Royal Agricultural Society to that town was given up late last autumn. They then appealed to the City of Birmingham to receive the Society. That appeal was most promptly responded to by the local authorities, and he had now to express their thanks for the very prompt and generous way in which they had received the Society. (Hear, hear.) He well remembered the last show at Birmingham, which was held in Aston Park He was told that Aston Park was now covered with streets and houses; and the town had gone on increasing, so that instead of a Mayor they had a Lord Mayor. It was an additional recommendation to this vote that, as they could not find a suitable showyard within the city, they had obtained, through the good offices of the authorities of Sutton Coldfield, the present splendid ground, which was offered to them in a most prompt and liberal spirit.

He need not say what a great advantage it was to the Society to visit these large towns, where the producer and the consumer were brought together, and where the dwellers in towns had the opportunity of seeing their big Shire horses and other descriptions of live stock. They would also be interested in the trials of self-moving vehicles, which he thought would be much used for a certain class of goods, though he trusted that their use would not seriously affect the demand for agricultural horses. (Hear, hear.) The City of Birmingham had met them most handsomely in the matter of local prizes. They had exceeded the liberal amount offered in 1876, and on the present occasion the sum amounted to £1,255. He asked them to pass a very cordial vote of thanks to the local authorities of Birmingham. They were fortunate in having a Lord Mayor of great public spirit, who possessed the entire confidence of the citizens, and who was able therefore to benefit the Society in the way which they were glad now to acknowledge

The Hon. CECIL PARKER (Hon. Director) seconded the resolution, saying that the Local Committee had met the Society in every possible way, and had enabled them to present a showyard such as they had seldom had before.

The motion having been carried unanimously,

The LORD MAYOR OF BIRMINGHAM (the Right Hon C. G Beale) thanked the meeting very sincerely for the compliment conveyed by the resolution. He felt that he ought rather to join them in thanking those who had done the work, and that personally he had done nothing but receive innumerable courtesies from all the Members of the Council with whom he had come in contact. It would indeed be strange if when such a gathering was held in their midst they did not take an interest in it. He hoped the Society would have no reason to regret that it had come into contact with a population with a little money to spend. (Laughter.) It was hopeless to expect a recurrence of the visit for many years, but still he trusted the time would not be so long distant when some of them might be able to heartily welcome another visit from the Royal Agricultural Society of England. (Cheers.)

Thanks to the Mayor and Corporation of Sutton Coldfield.

The Earl of DERBY, K.G., moved: "That the best thanks of the Society are due, and are hereby tendered, to the Mayor and Corporation of Sutton Coldfield for their cordial reception of the Society." He said it was known to most of them that the Royal Agricultural Society found itself in a little difficulty about a year ago. Owing to circumstances which need not now be referred to the locality of the show had to be changed, as it were, at the last moment, and they of the Society felt that they were deeply indebted to the local authorities, who had so promptly and readily come forward to enable their show to be held under such conditions as they saw this year. The show had been spoken of as held at Birmingham. Though held with the assistance of the Birmingham Corporation, and the co-operation of the Lord Mayor and those who acted with him, still, as a matter of fact, the show was being held within the town of Sutton Coldfield. They desired, therefore, to express their thanks to the Mayor and Corporation of that town for the way in which they had co-operated with the Lord Mayor and Corporation of Birmingham. The heartiness of their welcome to the Society was evidenced by the adornment of the routes by which visitors were to proceed to the showyard. The Royal borough, as Sutton Coldfield was, had extended a Royal welcome to the Royal Society. There was only one thing more to complete the quartette, and that was Royal weather. He hoped that when the Prince of Wales came to-morrow to pay, what he was informed was his first visit to the Royal borough, he would find all the conditions to which he had referred complete in themselves, and affording a most successful outcome of the Meeting. These things were not done without hard work and some trouble,

and they thanked the Mayor for the assiduity with which he had pressed these matters forward, and for the conditions under which they met there that day.

Mr. F. S. W. CORNWALLIS, M.P. (Senior Steward of Implements), seconded the resolution, and said that it was rather a melancholy privilege for him to do so, because he had hoped to see the Show in his own district at Maidstone on this occasion. But things being as they were, it gave him the greatest pleasure to second the resolution. There was a proverb of which their letter-bag daily reminded them, "that he gave twice who gave quickly." They owed a deep debt of gratitude to the local authorities for the prompt way in which they had come forward at the last moment and made the necessary preparations, which had resulted in one of the best showyards they had ever had. It was a very material help to the work of the Stewards that they had had such a compact showyard wherein to carry out their duties.

The resolution having been passed unanimously,

The Mayor of SUTTON COLDFIELD (Mr. A. L. Crockford) said that when the City of Birmingham sent their invitation to the Society the Royal borough of Sutton Coldfield was included. As a matter of fact, Sutton was a little satellite which revolved round its very big sun, and he did not know whether to regard himself as a Birmingham citizen or a Sutton citizen. The vote of thanks was really uncalled for, because their thanks were due to the Society for coming to them. When the question was discussed at their Council Chamber he had said that Sutton consisted almost exclusively of sites for agricultural shows, and that in that direction at least they were able to give points to their big neighbour. (Laughter.) He was inclined to think that they had justified that statement. He had to thank the Council for the innumerable courtesies which they had showered upon himself in his capacity as Mayor. The visit of the Royal Agricultural Society would be always remembered by him as a most pleasing event in his Mayoralty.

Suggestions of Members.

In reply to the usual question from the Chair as to whether any Governor or Member had any question to ask or suggestion to offer for the consideration of the Council,

Mr. ROBERT HUSSEY complained that the rule which required the measurement of all horses in the height classes had not been strictly carried out this year.

Presentation to the Hon. Cecil T. Parker.

The PRESIDENT then said: We now proceed to what is perhaps unusual at meetings of this sort. I have to make a presentation from you to one of the Officers of the Council. I approach this subject with mingled feelings of regret and pleasure. I regret that the Council and the Society are losing the services of one who has done much for us. At the same time I have much satisfaction in being on this occasion the mouthpiece of this complimentary presentation. I need not go into detail as to the duties of the Honorary Director. You have only to look around you in this Showyard to see what a multiplicity of subjects must come before him. You see the numbers of implements, the numbers of animals of all sorts, and the concourse of people. You will understand what an immense amount of organisation and administration all this requires. Mr. Parker succeeded a very able Director. He has himself proved his capacity and ability. On his shoulders rests really the principal government of this small state that for a temporary period has been transplanted to Sutton Coldfield, and which is not under the direction of Mr. Mayor of Sutton. He has amply proved his ability to conduct this show in the interest of exhibitors and the public. No doubt he has very good reasons for taking the course which he has, but we regret, nevertheless, that he has been obliged to retire, and we owe a great deal to him. Let us hope that a long life of prosperity and utility may be left to him. In conclusion, I have the greatest possible pleasure to present to Mr. Parker, as a recollection of the six Meetings of the Royal Agricultural Society over which he has presided as

Honorary Director, and as a token of our gratitude to him for his services, the Address which you now see, and which Sir Ernest Clarke, the Secretary, will read. I have, in addition, to offer to Mr. Parker, in the name of the Council and of the Society, the gift of plate which you also see before me. (Cheers.)

The SECRETARY then read the Address, the terms of which are as follows:—

AT A MEETING OF THE COUNCIL,

Held on Wednesday, May 25, 1898,

EARL SPENCER, K.G., PRESIDENT, IN THE CHAIR,

It was unanimously resolved, on the motion of His Royal Highness the DUKE OF YORK, K.G., Trustee (President, 1896–97), seconded by Sir JOHN THOROLD, Bart., Vice-President (President, 1894–5):—

(1) That this Council, having received an intimation from the Hon. Cecil Parker that, owing to the increasing calls upon his time, he does not propose to offer himself for re-election as Honorary Director, desires to place on record its high appreciation of the valuable services rendered during the last six years by Mr. Parker as Honorary Director of the Country Meetings of the Society.

(2) That the Hon. Cecil Parker be elected a Life Governor, and that he be requested to accept from the Society a piece of plate of the value of 100*l*. in grateful recognition of the services rendered by him.

(L.S.)
SPENCER, *President.*
R. NIGEL F. KINGSCOTE, *Trustee.*
ERNEST CLARKE, *Secretary.*

The Address has been handsomely illuminated on vellum. At the top in the centre is the large die of the Society surmounted by the Imperial crown, and with sheaves of corn, a scythe, a sickle, and other implements emblematical of agriculture arranged on either side of it. At the left-hand corner are the letters R.A.S.E. in monogram, and at the right-hand corner the letters C. T. P. in monogram. The borders on either side of the Address contain the arms of the six cities and boroughs visited by the Society during Mr. Parker's term of office as Honorary Director—viz., Chester, 1893; Cambridge, 1894; Darlington, 1895; Leicester, 1896; Manchester, 1897; and Birmingham, 1898. In the centre at the foot of the Address are Mr. Parker's own arms.

The plate presented to Mr. Parker consists of the following pieces of silver: A waiter of Chippendale pattern; a chased kettle and stand; an inkstand; and a pair of candlesticks. The salver bears round the edge the following inscription:—

Presented on the 21st June, 1898, to the Hon. Cecil T. Parker, by the Royal Agricultural Society of England, in grateful recognition of valuable services rendered by him as Honorary Director of the Country Meetings of the Society from 1893 to 1898.

The Hon. CECIL PARKER, in rising to reply, was received with loud cheers. He said: I am greatly indebted to this large gathering of Members for the cordiality with which by their applause they have endorsed the generous words of the President, and ratified the highly complimentary resolutions passed by the Council at their last meeting. This beautiful Address and plate will be a pleasant recollection to me of six years passed in friendly association with the Members and exhibitors who constitute the backbone of these large gatherings of agriculturists. It would be hardly possible that in carrying out the instructions of the Council in the administration of these huge shows I have satisfied everybody; but I will ask you to believe that I have been anxious to give due consideration to the wishes and requests of exhibitors, and I think I may claim for these shows that they are carried on with a minimum of friction and a maximum of good feeling. (Cheers.) The post of Honorary Director is one which confers distinction upon the holder. It is also one of great responsibility and anxiety, and it entails a very real amount of hard work. Many of you know my reasons for retiring, but for those who do not know I may say that the work of these shows has increased of late years so much that I find it quite impossible to give the necessary time and attention to the duties of the office of Director. Visitors to these shows expect when they arrive at the entrance gates to see everything ship-shape; and the staff engaged on this one week's show is large enough to carry on an exhibition of this kind for months and weeks. Visitors do not consider the days, weeks, and months which it takes to settle all the details connected with

this undertaking. Unlike other shows, there is no preliminary canter; but everything has to be carefully thought out before the opening. We do our best, and those who follow me will do their best to uphold the prestige of our shows. During the five years I have held the post of Honorary Director I have had the pleasure to see some 12,000*l.* added to the funds of the Society, *i.e.*, about 2,500*l.* a year. I trust that Birmingham will not spoil the sequence of financial successes, and that we may have a good balance to our credit. I thank you for the great honour you have done me, and I would bespeak for my friend and successor, Mr. Crutchley, the same courtesy and consideration which you have always extended to me. (Cheers.)

Vote of Thanks to the President.

Mr. C. R. Moorsom-Mitchinson-Maude then moved a vote of thanks to the President for his services during the past year. He said that the meeting thoroughly understood the work which Lord Spencer had so ably carried out. His Lordship was the second Lord Spencer who had presided over the Society. The very first meeting of the Society was presided over by the Earl Spencer of the day—a man who was known throughout Europe by his work on behalf of agriculture. It was therefore exceedingly appropriate that the present Lord Spencer had been President during the past year. His Lordship had devoted his attention to the work of the Society, and he had ably succeeded in the office he had held.

Mr. W. C. Booth seconded the resolution, and said that his Lordship had most conscientiously fulfilled the duties of his high position. They expected nothing else from him, because they knew the love he had for the great work which he had performed. They, as breeders of Shorthorns, recognised the fact that he bore an honoured name; that the third Earl Spencer was an eminent pioneer in the breeding of Shorthorns, and that his Lordship had the warmest sympathies with rural England. As sportsmen, they recognised that he was in the forefront of sportsmen as a fox-hunter after their own hearts. He had great pleasure in seconding the vote of thanks to the noble Earl.

The Secretary then put the resolution, which was carried by acclamation.

The President, in reply, thanked them extremely for the cordial way in which they had received this resolution. The mover of it referred to a predecessor of his in the office of President. He confessed that he felt much gratification in thinking that he had filled this chair sixty years after his uncle had filled it as the first President of the Society. It was a singular thing that in this year, which might be called the Diamond Jubilee of the Society, one of the same name as the first President should be again in this position. He did not know whether many of them had read a very interesting account of the old Board of Agriculture written for the Journal by Sir Ernest Clarke. That Board was the precursor of the Royal Agricultural Society of England, which had brought them all there that day. In looking over that paper, he could not help being struck by the enormous advance and change which had taken place in this country. They found that that old Society had battled with all sorts of questions which were now altogether set at rest and decided—questions which Parliament would now decide, rather than a Society like this. He found disputes going on about weights and measures, difficulties with regard to the taxation of land, the taxation of draining tiles, and other questions which they would never dream of touching. They did also a great deal that this Society did; they spread an enormous deal of information throughout the country about the state of agriculture at that time; they had a Consulting Chemist; they had a small show; and when he told them where the Consulting Chemist had his farm, they would see what a tremendous change had taken place. The experimental plots were in Knightsbridge. He thought the present successor to Sir Humphry Davy, the distinguished Chemist of the Board of Agriculture, would be very much puzzled to carry out even one of his experiments, if he had to

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carry it out in Knightsbridge. The Show was held at Aldridge's Repository in St. Martin's Lane. There was hardly one of the classes in their Show for which they could contrive to provide accommodation at Aldridge's. He merely mentioned these facts to show what an immense change had taken place with regard to agriculture. They and their predecessors had learned some lessons from the old Board of Agriculture, which only lasted about thirty years. One of the fundamental rules, which had been rigidly adhered to by this Society, was that it should not in any way mix itself up with political questions. That was one of the wisest things ever done by the founders of the Society. In those days there was a good deal more to be done even than now. Yet those who sat round him would admit that there was still much to be done in the way of improvement to meet the new circumstances that were continually arising. With regard to competition, he thought it was true that whatever changes might come, one thing remained, which was that the best articles of manufacture, and the best animals, would always command the best value; and the value of these products would seldom fall to any appreciable degree. He believed that the efforts of a society like theirs were very useful towards promoting the best, the cheapest, and the most commodious means of carrying on agriculture, and of producing the best stock to be seen in any part of the world. He felt it a very high honour to have filled that chair. He had to thank the officials for so ably supporting him, and he should always have the pleasing recollection that he had occupied this position. He thanked them extremely for the very kind way in which they had received him that day. (Cheers.)

Presidency for 1898-99.

Mr. JACOB FAIR then moved: "That the Earl of Coventry do take the Chair as President after the conclusion of the present Meeting." He said it would be presumptuous on his part to attempt to explain to a meeting of that kind what were his Lordship's qualifications for the high position they desired him to occupy. Lord Coventry was well known, not only to the Members of the Society, but to the whole of the United Kingdom, as a great agriculturist and sportsman, and as a nobleman highly qualified for the position in which he was sure the Members of the Society unanimously desired to place him.

The motion having been seconded by Mr. THOMAS STIRTON, and carried unanimously,

The Earl of COVENTRY returned his very hearty thanks for the resolution they had passed, and which had been proposed in such very kind terms. He could assure them he appreciated very highly the honour conferred upon him by being elected President of that great Society for the ensuing year. He was fully conscious of his own shortcomings, but with their support he should endeavour to discharge the duties of the office to the utmost of his abilities. He felt at some disadvantage in having to succeed in the chair his old friend, Lord Spencer, whose great knowledge of agriculture, and whose wide official experience in all legislation connected with agriculture, had invested him with an authority which none would dispute. He was much obliged for the honour they had conferred upon him, and he would endeavour to carry out the duties of the office, with their kind assistance, to the best of his ability. (Cheers.)

The proceedings then terminated.

BIRMINGHAM MEETING.

JUNE 18 TO 24, 1898.

PRESIDENT:

EARL SPENCER, K.G.,
Althorp, Northampton.

OFFICIALS:

Honorary Director.

The Hon. CECIL T. PARKER, Eccleston, Chester.

Stewards of Live Stock.

Lieut.-Col. J. F. CURTIS-HAYWARD, Quedgeley, Gloucester.
ALFRED J. SMITH, Rendlesham, Woodbridge, Suffolk.
S. P. FOSTER, Killhow, Carlisle.
J. P. TERRY, Berry Field, Aylesbury, Bucks.

Stewards of Implements.

F. S. W. CORNWALLIS, M.P., Linton Park, Maidstone, Kent.
J. BOWEN-JONES, Ensdon House, Montford Bridge, Salop.
G. H. SANDAY, Blackwell Hall, Chesham, Bucks.

Steward of Dairying.

J. MARSHALL DUGDALE, Llwyn, Llanfyllin, *viâ* Oswestry.

Steward of Produce.

E. VINCENT V. WHEELER, Newnham Court, Tenbury, Worcestershire.

Steward of Forage.

HOWARD P. RYLAND, Moxhull Park, Erdington, near Birmingham.

Stewards of Finance.

W. FRANKISH, Limber, near Brocklesby, Lincolnshire.
S. ROWLANDSON, Newton Morrell, Barton, Yorkshire.

Secretary.

Sir ERNEST CLARKE, 13 Hanover Square, London, W.

JUDGES OF IMPLEMENTS.

Self-moving Vehicles.

BRYAN DONKIN, C.E., Southwark Park Road, Bermondsey, S.E.
Professor UNWIN, F.R.S., 29 Palace Gate, Kensington, W.
F. W. WEBB, C.E., Crewe.

Methods of Safeguarding Chaff-Cutters and Miscellaneous Implements.

R. M. GREAVES, Wern, Tremadoc, Carnarvon.
BAYNTON HIPPISLEY, Ston Easton Park, Bath.

JUDGES OF STOCK, &c.

(*As finally corrected.*)

HORSES.

Hunters.—*Classes* 1, 3, 4, *&* 7–10.

Lord RATHDONNELL, Drumcar, Dunleer, co. Louth.
OWEN C. WALLIS, Crackshill Lodge, Kilsby, Rugby.

Hunters.—*Classes* 2, 5, 6, *&* 11–13.

DIGBY COLLINS, Newton Ferrers, Callington, Cornwall.
T. H. HUTCHINSON, The Manor House, Catterick, Yorks.

Cleveland Bays and Coach Horses.
Classes 14–21.

JOHN WHITE, The Grange, Appleton Roebuck, Bolton Percy.
GEORGE C. WHITWELL, Egglescliffe, Yarm-on-Tees.

Hackneys.—*Classes* 22–32.

C. E. E. COOKE, Hinxton Grange, Saffron Walden.
JOHN MAJOR, Sledmere Grange, York.

Ponies, Mountain & Moorland Ponies, Harness Horses and Ponies.
Classes 33–39 *&* 50–52.

JOHN HILL, Church Stretton, Salop.
TOM MITCHELL, Eccleshill, Bradford.

Polo Ponies.—*Classes* 40–49.

Capt. D. ST. G. DALY, Heythrop, Chipping Norton.
Sir RICHARD D. GREEN PRICE, Bart., The Poplars, Kingsland, Shrewsbury.

Shires and Draught Horses.
Classes 53–62 *&* 75–78.

Capt. HEATON, Worsley, Manchester.
CHARLES W. TINDALL, Wainfleet.

Clydesdales.—*Classes* 63–68.

JAMES ALSTON, Crosslee, Stow, Midlothian.
JAMES WEIR, Sandilands, Lanark, N.B.

Suffolks.—*Classes* 69–74.

D. A. GREEN, East Donyland, Colchester.
H. SHOWELL, Hasketon, Woodbridge, Suffolk.

CATTLE.

Shorthorns.—*Classes* 79–85.

GEORGE JOHN BELL, Standingstone, Wigton.
JAMES HOW, Broughton, Huntingdon.

Herefords.—*Classes* 86–92.

THOMAS FENN, Estate Offices, Downton Castle, Ludlow.
AARON ROGERS, The Rodd, Presteign.

Devon and Sussex.
Classes 93–98 *&* 99–103.

SAMUEL KIDNER, Bickley, Milverton, Som.
ALFRED STANFORD, Eatons, Steyning, Sussex.

Longhorns.—*Classes* 104–106.

A. S. BERRY, Pheasey Farm, Great Barr, Birmingham.
H. E. THORNLEY, Radford Hall, Leamington.

Welsh.—*Classes* 107–111.

O. H. FOULKES, Bodrwyn, Llangefni, Anglesey.
JOHN ROBERTS, Well House, Chester.

Red Polled and Aberdeen Angus.
Classes 112–116 *&* 117–121.

GEORGE J. WALKER, Portlethen, Aberdeen.
CHARLES WATERS, Postwick, Norwich.

Galloways and Ayrshires.
Classes 122–126 *&* 127–131.

ROBERT MONTGOMERIE, Lessnessock, Ochiltree, N.B.
ROBERT SHENNAN, Balig, Kirkcudbright, N.B.

Jerseys.—*Classes* 132–136.

W. ASHCROFT, 13 The Waldrons, Croydon.
ERNEST MATHEWS, Chequers Mead, Potter's Bar.

Guernseys.—*Classes* 137–141.

ANDREW DUNLOP, Church Farm, Hendon.
CHRISTOPHER MIDDLETON, Marton, R.S.O., Yorkshire.

Kerries and Dexters.—*Classes* 142–145.

H. D. BETTERIDGE, Drayton St. Leonard's, Wallingford.
F. N. WEBB, Babraham, Cambridge.

Dairy Cattle.—*Class* 149.

THOMAS CATTELL, Erdington, Birmingham.
RICHARD HENSHAW, Tythby Grange, Bingham, Notts.

SHEEP.

Leicesters.—*Classes* 150–154.

BENJAMIN PAINTER, Burley-on-the-Hill, Oakham.
JAMES J. STAMPER, Highfield House, Nunnington, York.

Cotswolds.—*Classes* 155–159.

DAVIS BROWN, Marham Hall, Downham Market.
J. J. GODWIN, Troy, Somerton, Banbury.

Lincolns.—*Classes* 160–165.

CHARLES CLARKE, Bayard's Leap, Sleaford.
JONAS WEBB, Melton Ross, Barnetby Junction, Lincoln.

Oxford Downs.—*Classes* 166–170.

A. F. MILTON DRUCE, Bladon, Woodstock, Oxon.
HENRY OVERMAN, Kipton House, Weasenham, Swaffham, Norfolk.

Shropshires. (Rams.)
Classes 171–174.

CHARLES COXON, Elford Park, Tamworth.
MATTHEW WILLIAMS, Whiston Grange, Albrighton, Wolverhampton.

Shropshires. (Ewes.)
Classes 175–177.

J. E. FARMER, Felton, Ludlow.
A. E. MANSELL, Harrington Hall, Shifnal.

Southdowns.—*Classes* 178–182.

ALLAN COOPER, Norton, Bishopstone, Lewes.
GEORGE JONAS, Old Vicarage, Duxford, Cambridge.

Hampshire Downs.—*Classes* 183–187.

J. CARPENTER, Manor House, Burcombe, Salisbury.
WILLIAM NEWTON, Crowmarsh Battle, Wallingford, Berks.

Suffolks.—*Classes* 188–192.

D. A. GREEN, Junior, Fingringhoe Hall, Colchester.
J. R. GRIMSDY, St. Helena, Dunwich, Saxmundham.

Border Leicesters.—*Classes* 193–197.

JOHN H. LAURIE, Hardens, Duns, N.B.
WILLIAM PRINGLE, Branton, Glanton, R.S.O., Northumberland.

Somerset and Dorset Horned.
Classes 198 & 199.

HENRY MAYO, 4 Temple Terrace, Dorchester.
GEORGE E. RICHARDS, Wimborne, Dorset.

Kentish or Romney Marsh.
Classes 200 & 201.

H. M. COBB, Higham, Rochester.
ARTHUR FINN, Westbroke, Lydd, Kent.

Wensleydales.—*Classes* 202 & 203.

JAMES PICKARD, Thoresby, Aysgarth, Yorks.
MATTHEW WOOD, Ellington House, Ellington, Masham, R.S.O.

Cheviots.—*Classes* 204 & 205.

G. G. REA, Middleton, Wooler, Northumberland.
THOMAS O. THORNTON, Hyndlee, Hawick, N.B.

Black-faced Mountain.
Classes 206 & 207.

J. K. BORLAND, North Balloch, Girvan, N.B.
HENRY WALTON, How Burn, Alston, Carlisle.

Lonks & Herdwicks.
Classes 208 & 209 ; 210 & 211.

WILLIAM ABBOTT, Beckstones, Thornthwaite, Keswick.
JOSEPH M. GREEN, Steeton, Keighley, Yorks.

Welsh Mountain.—*Classes* 212 & 213.

WILLIAM DAVIES, Llysfasi, Ruthin.
OWEN PRICE, Nantyrharn, Cray, R.S.O., Brecon.

PIGS.

Whites.—*Classes* 214–225.

JOHN BARRON, Elvaston Nurseries, Borrowash, Derby.
ANTHONY F. NICHOL, Bradford, Belford, Northumberland.

Berkshires.—*Classes* 226–229.

W. A. BARNES, Hasluck's Green Farm, Shirley, Birmingham.
EDWARD BURBIDGE, South Wraxhall, Bradford-on-Avon.

Tamworths.—*Classes* 230–234.

J. R. RANDELL, Rock House, Yatton, Somerset.
Major F. A. WALKER-JONES, Queen's Park, Chester.

POULTRY.

Classes 235–326.

HERBERT ATKINSON, Ewelme, Wallingford, Berks.
EDWARD BROWN, Velmead, Caversham, Reading.
WILLIAM BYGOTT, Rye Hill House, Ulceby, Lincs.
ARTHUR C. MAJOR, Park Farm, Ditton, Langley, Bucks.
BENJAMIN RAWNSLEY, Devonshire Hotel, Skipton, Yorks.

PRODUCE.

Butter and Cream Cheese.

Classes 327–330; 335 & 336.

Miss M. M. MACQUEEN, County Council Farm, Hutton, Preston.
Miss E. A. ROBERTS, Lleweni Hall Dairy School, Denbigh.

Cheese.—*Classes* 331–334.

JOHN BENSON, Midland Dairy Institute, Kingston Fields, Derby.
W. H. HART, Highfields, GravellyHill, Birmingham.
G. W. OUBRIDGE, 5 & 7 Town Hall Buildings, Newcastle-on-Tyne.

Cider and Perry.—*Classes* 337–340.

F. J. HAYES, The Elms, West Pennard, Glastonbury.
JOHN WATKINS, Pomona Farm, Withington, near Hereford.

Hives and Honey.—*Classes* 341–361.

THOMAS W. COWAN, 31 Belsize Park Gardens, Hampstead, N.W.
HENRY JONAS, Portley Wood, Whyteleafe, Surrey.
THOMAS D. SCHOFIELD, Oakfield, Alderley Edge, Cheshire.

HORSE-SHOEING COMPETITIONS.

HENRY G. LEPPER, M.R.C.V.S., Walton Street, Aylesbury.
J. M. PARKER, M.R.C.V.S., 9½ Moor Street, Birmingham.

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OFFICIAL REPORTER.

W. FREAM, B.Sc LL.D., 13 Hanover Square, London, W.

AWARDS OF PRIZES AT BIRMINGHAM.

ABBREVIATIONS.

I., First Prize. II., Second Prize. III., Third Prize. R. N., Reserve Number. H. C., Highly Commended. Com., Commended.

N.B.—The responsibility for the accuracy of the description, pedigree, or eligibility to compete of the animals mentioned below rests solely with the Exhibitors.

Unless otherwise stated, each Prize Animal in the Classes for Horses, Cattle, Sheep, and Pigs was "bred by Exhibitor."

HORSES.

Thoroughbred Stallions.

Winners of the Four Queen's Premiums of £150 *each, awarded by the Royal Commission on Horse Breeding at the* SPRING SHOW, *held at* THE ROYAL AGRICULTURAL HALL, LONDON, *March* 8–10, 1898. *Gold Medals, value* £10 *each, were also awarded by the Birmingham Local Committee for the three Stallions A, B, and D, which were exhibited at the Birmingham Meeting.*

A. LEWIS JAMES SHIRLEY, Red House, Ely, Glamorganshire, for **Alvin**, chestnut, foaled 1890; *s.* Master Kildare, *d.* Nightgear *by* King Alfred, *g d.* Bedgown *by* Bedminster.

B. GEORGE DU CROS, Condon Hall, Coventry, for **Button Park**, chestnut, foaled 1883; *s.* Avontes, *d.* Make Sure *by* General Peel, *g. d.* Makeshift *by* Voltigeur; bred by the late Alexander Taylor.

C. JOHN FORSYTH REES, Llanboidy, Whitland, Carmarthenshire, for **Pantaloon**, chestnut, foaled 1887; *s* Zealot, *d.* Frivolity *by* Macaroni, *g. d.* Miss Agnes *by* Birdcatcher; bred by G. F. Lynden.

(*This horse was not exhibited at the Birmingham Meeting.*)

D. FRANCIS W. G. GRESWOLDE-WILLIAMS, Strensham Court, Tewkesbury, for **Q. C.**, brown, foaled 1883; *s.* Wisdom, *d.* Brenta *by* Parmesan, *g. d.* Black Lily *by* Longbow; bred by A. Hoole, Wisdom Stud Farm, Wetherby.

Hunters.

No. in Catalogue.

Class 1.—*Hunter Mares (with Foals at foot), 15 stone and upwards.* [4 entries, 1 absent.]

3 I. (£20.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Scarlet 873**, chestnut, foaled 1886 [foal *by* Ruddigore], bred by Mr. Vickers, Cherry Burton, Yorks; *s.* Lambton.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

4 II. (£10.)—MRS. LANGDALE-KELHAM, Bourne Lodge, Boxmoor, for **Kismet** 769, brown, foaled 1888 [foal *by* Colonial], bred by Thomas Thwaites, Coltstones, Warton, Carnforth; *s.* Carthusian.

Class 2.—*Hunter Mares (with Foals at foot),* 12 *to* 15 *stone.* [13 entries, 2 absent.]

7 I. (£20.)—JOHN COOPER, Brook Hill, East Haddon, Northampton, for **Sweetbriar** 1228, brown, foaled 1886 [foal *by* Corrèze], bred by the Hon. and Rev. J. W. Lascelles, Goldsborough, Yorks; *s.* Highthorn, *d. by* King Bryan.

8 II. (£10.)—N. R. FLEMING, Normanby Hall, Middlesbrough, for **The Alabama** 1232, chestnut, foaled 1886 [foal *by* Cabin Boy], bred by A. J. Schwabe, Orleans Club, St. James's, S.W.; *s.* Privateer, *d.* Faux Pas *by* Wild Oats.

9 III. (£5.)—B. G. H. GEE, Lock's Mills House, Bristol, for **Fanny Fern** 1377, chestnut, foaled 1892 [foal *by* Yard Arm], bred by M. P. Cleary, Ballycullane, Kilmallock, co. Limerick; *s.* Clanronald, *d. by* Victor.

14 R. N. & H. C.—F. B. WILKINSON, for **Lady Templar.**
H. C.—R. W. SMIRTHWAITE, for No. 13, **Firewater**; H. H. WILSON, for No. 15, **Pride of Merrion.**

Class 3.—*Hunter Foals, foaled in* 1893, *the produce of Mares exhibited in Class* 1 *or* 2.[1] [12 entries, 1 absent.]

19 I. (£10.)—JOHN COOPER, Brook Hill, East Haddon, Northampton, for bay filly; *s.* Cabin Boy, *d.* Saucy Nell 1204 *by* The Bold Marshal. (*Exhibited with No.* 6)

26 II. (£5.)—F. B. WILKINSON, Cavendish Lodge, Edwinstowe, Newark, for foal; *s.* Kilmarnock, *d.* Lady Templar 789 *by* Knight Templar. (*Exhibited with No.* 14.)

29 III. (£3.)—R. A. YERBURGH, M.P., Woodfold Park, Blackburn, for brown colt; *s.* Goschen, *d.* Minho *by* Herculean Chief. (*Exhibited with No.* 17.)

18 R. N & H. C.—MRS. BACCHUS, Nuthurst Farm, Hockley Heath.

Class 4.—*Hunter Mares or Geldings,* 15 *stone and upwards, foaled in* 1891, 1892, *or* 1893.[1] [10 entries, none absent.]

39 I. (£25.)—C. M. PRIOR, Adstock Manor, Winslow, Bucks, for **Coollattin**, chestnut gelding, foaled 1892, breeder unknown; *s.* FitzWilliam, *d. by* Young Gideon.

38 II. (£15.)—T. D. JOHN, Chaldeans Stud Farm, St. Fagans, Cardiff, for **Pope**, bay gelding, foaled 1893, bred by D. W. Taylor, Bardwell, Bury St. Edmunds; *s.* Poplar.

31 III. (£10.)—THOMAS BRADLEY, The Manor Farm, Uffington, Stamford, for **Sultan**, brown gelding, foaled 1892; *s.* Havoc, *d.* Sally.

34 R. N. & H. C.—JOHN DRAGE. 35 Com.—F. J. GIBBS, for **Nobleman.**

Class 5.—*Hunter Mares or Geldings,* 13 *stone* 7 *lb. to* 15 *stone, foaled in* 1891, 1892, *or* 1893.[1] [19 entries, 2 absent.]

53 I. (£25.)—T. D. JOHN, Chaldeans Stud Farm, St. Fagans, Cardiff, for **Gendarme**, chestnut gelding, foaled 1892, breeder unknown; *s.* Blueblood.

[1] Prizes given by the Birmingham Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

51 **II.** (£15.)—EDWARD HODGSON, The Hollows, Bridlington, for **Faultless**, chestnut gelding, foaled 1893, bred by R. E. Dixon, Benningholme Hall, Hull; *s.* Southampton, *d.* Lady Dora 1075 *by* Gallant.

52 **III.** (£10.)—SAMUEL ISHERWOOD, Shorfield, Dunscar, Bolton, for **Sterling**, chestnut gelding, foaled 1892, bred by Chambers Bros., Wexford; *s.* Florin, *d. by* Brian O'Lynn.

46 **R. N. & H. C.**—J. W. COREN, Park Road, Gloucester, for **Electricity.**
H. C.—J. S. DARRELL, for No. 47, **Banker**; R. J. MANN, for No. 56, **Will Bluck**; LORD HENRY PAULET, for No. 57, **Carlist**; H. SHOWELL, for No. 58, **Blarney.**

Class 6.—*Hunter Mares or Geldings,* 12 *stone to* 13 *stone* 7 *lb., foaled in* 1891, 1892, *or* 1893.[1] [10 entries, 4 absent.]

65 **I.** (£25.)—T. D. JOHN, Chaldeans Stud Farm, St. Fagans, Cardiff, for **Thorney**, bay gelding, foaled 1892, breeder unknown; *s.* Munchausen.

62 **II.** (£15.)—JOHN DRAGE, Chapel Brampton, Northampton, for **Dandy**, bay or brown gelding, foaled 1892; bred by John Drage, Holcot, Northampton; *s.* Blue Ruin.

63 **III.** (£10.)—JOHN F. FOWKE, Wing House, Oakham, for **Confidence**, chestnut gelding, foaled 1892; *s.* Pedestrian, *d.* Empress *by* The Lawyer.

59 **R. N.**—A. J. BROWN, Marr Grange, Doncaster, for **Nimrod.**

Class 7.—*Hunter Mares or Geldings, foaled in* 1894.[1] [16 entries, 4 absent.]

79 **I.** (£25.)—JOHN LETT, Rillington, York, for **Welcome**, brown gelding, bred by Philip Baldwin, Lower Broadheath, Worcester; *s.* Munchausen, *d.* Satanella 1606 *by* Carlos.

69 **II.** (£15.)—THOMAS BRADLEY, Uffington, Stamford, for **Sequent**, bay gelding; *s.* Havoc, *d.* Sally.

75 **III.** (£10.)—FRANK R. FRY, Rockhill, Keynsham, Bristol, for **Huntsman**, bay gelding, breeder unknown.

73 **R. N. & H. C.**—EDWARD DALGLISH, Dunchurch, Rugby, for **Multan.**

Class 8.—*Hunter Geldings, foaled in* 1895.[1] [14 entries, 2 absent.]

94 **I.** (£15.)—T. D. JOHN, St. Fagans, Cardiff, for **Raby**, chestnut, bred by J. Ingledew, Lowfields, Fencote, Bedale; *s.* Knight of Raby, *d.* Jess 1421.

93 **II.** (£10.)—EDWARD HODGSON, Bridlington, for **Manxman**, bay, bred by W. Dobson, Ugthorpe, Whitby; *s.* First King, *d. by* Bay President.

88 **III.** (£5.)—JOHN DRAGE, Chapel Brampton, Northampton, for bay; *s.* Mount Gifford.

86 **R. N. & H. C.**—A. J. BROWN, Marr Grange, Doncaster, for **Young Brian.**
Com.—THOMAS BRADLEY, for No. 85, **Sequel**; T. E. MARSON, for No. 95.

Class 9.—*Hunter Fillies, foaled in* 1895. [8 entries, 1 absent.]

100 **I.** (£15.)—WILLIAM CARTER, Ailesworth, Peterborough, for **Bertha**, bay; *s.* Havoc, *d.* Lady Betsy 559 *by* Outfit.

103 **II.** (£10.)—JOHN LETT, Rillington, York, for **Marmalade**, chestnut, bred by R. Philyps, Clains, Worcester; *s.* Ringleader, *d. by* Merrymack.

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[1] Prizes given by the Birmingham Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

90 **III.** (£5.)—PHILIP M. BROWNE, Fornham All Saints, Bury St. Edmunds, for **Melody** 1505, bay; *s.* Cobbler, *d.* Piano 1559.

106 **R. N. & H. C.**—F. W. G. GRESWOLDE-WILLIAMS, for **Lulsley.**

104 **Com.**—RALPH SNEYD, Keele Hall, Newcastle, Staffs., for **Tigris.**

Class 10.—*Hunter Geldings, foaled in* 1896.[1] [13 entries, 3 absent.]

115 **I. (£15.)**—T. D. JOHN, Chaldeans Stud Farm, St. Fagans, Cardiff, for **Huntsman**, chestnut, bred by John R. Raby, Cayton, Scarborough; *s.* Roscius, *d.* Black Bess.

109 **II. (£10.)**—ANDREW J. BROWN, Marr Grange, Doncaster, for **Young Stirling**, chestnut, bred by Chambers Bros, Wexford; *s.* Florin, *d. by* Brian O'Lynn.

118 **III.** (£5.)—SAMUEL S. RAINGILL, The Grange, Ringway, Altrincham, for **Huntsman**, bay gelding; *s.* Par-ci-par-là, *d.* Bluebell *by* Melton II.

113 **R. N. & H. C.**—J. HOWKINS. 108 **Com.**—J. BEACH, for **Forrard Away.**

Class 11.—*Hunter Fillies, foaled in* 1896. [16 entries, none absent.]

122 **I. (£15, & Champion.[2])**—B. G. H. GEE, Lock's Mills House, Bristol, for **Fancy Free** 1376, bay, bred by M. P. Cleary, Ballycullane, Kilmallock; *s.* Mackintosh, *d.* Fanny Fern 1377 *by* Clanronald.

125 **II.** (£10.)—G. W. & H. T. JOHNSON, Tur Langton House, Kibworth, Leics., for **Lady Grace** 1446, grey, bred by W. T. Hayr, Tur Langton; *s.* Andrassy, *d.* Lady Jane 1450.

133 **III.** (£5.)—F. B. WILKINSON, Cavendish Lodge, Edwinstowe, Newark, for **Misty**, bay, bred by Edwin Smith, Gringley-on-the-Hill, Bawtry; *s.* Child of the Mist.

127 **R. N. & H. C.**—J. H. LARGE, Crudwell, Malmesbury, for **Ballet Lass.**
123 **H. C.**—L. W. G. & G. B. G. HENSHAW, for **Mermaid.**
120 **Com.**—THOMAS BRADLEY, for **Rosebery.**

Class 12.—*Hunter Geldings, foaled in* 1897.[1] [9 entries, 1 absent.]

138 **I. (£15.)**—R. NICHOLL BYASS, Wyck Hill, Stow-on-the-Wold, for **Ulster Prince**, bay; *s.* Ulster King, *d.* Tormonite 473 *by* The Lawyer.

142 **II. (£10.)**—S. JAMES LEWIS, Wilcot, Nesscliff, Shrewsbury, for chestnut, bred by Geo. Lloyd, Hafod Offa, Llandissilio, Mont.; *s.* Soleil d'Or, *d. by* New Oswestry.

143 **III.** (£5.)—GEORGE MARTON, Muscoates, Kirby Moorside, for **Prodigal**, brown; *s.* Spendthrift, *d.* Misfortune 1511 *by* Lionel.

137 **R. N.**—MRS. BEACH, Foggy Furze, West Hartlepool, for **Tally Ho.**

Class 13.—*Hunter Fillies, foaled in* 1897. [13 entries, 3 absent.]

148 **I. (£15, & R. N. for Champion.[2])**—PHILIP S. DANBY, Church Farm, Offchurch, Leamington, for **Diamond Queen**, bay; *s.* The Weaver, *d.* Fairy Queen *by* Berseker.

155 **II. (£10.)**—H. E. THORNLEY, Radford Hall, Leamington, for chestnut; *s.* Wildfire, *d.* Empress 1366 *by* Chevronel.

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[1] Prizes given by the Birmingham Local Committee.
[2] Gold Medal, value £10. 10s., given by the Hunters' Improvement Society for the best Hunter Filly in Classes 9, 11, and 13.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

150 **III.** (£5.)—John Homes, Ledbury, for brown, bred by John Homes Woodcote Rise, Epsom; *s.* Red Eagle, *d.* Clitha.

152 **R. N. & H. C.**—J. Ingledew, Low Fields, Bedale, for **Rachel.**

Cleveland Bays.

Class 14.—*Cleveland Bay Stallions, foaled in* 1895. [4 entries.]

158 **I.** (£15.)—Philip H. Ellis, Filsham Road, St. Leonards-on-Sea, for **Broomgrove Pride** 1364, bay; *s.* Cleveland's Pride 1249, *d.* Snowflake 871 *by* Prince George 235.

161 **II.** (£10.)—George Scoby, Beadlam Grange, Nawton, Yorks, for **Beadlam Park** 1439, bay, bred by R. Fenwick, Kirby Moorside; *s.* Prince of the Dales 1411, *d.* Park Fanny 842 *by* Duke of Buckingham 596.

160 **III.** (£5.)—George Scoby, for **Beadlamite** 1368, bay, bred by F. E. C. Dobson, Dromonby House, Carlton, Northallerton; *s.* Hyllus 969, *d.* Lady Beadlamite 798 *by* Sportsman Junior 924.

159 **R. N. & H. C.**—F. Wilson Horsfall, Potto Grange, Yorks., for **Chloraine.**

Class 15.—*Cleveland Bay Stallions, foaled in* 1896. [5 entries, none absent.]

164 **I.** (£15.)—John Lett, Cleveland Stud Farm, Rillington, York, for **Lucky Depper**, bay, bred by H. C. Stephens, M.P., Cholderton, Salisbury; *s.* Luck's All 189, *d.* Depper 42 *by* Barnaby 21.

165 **II.** (£10.)—George Scoby, Beadlam Grange, Nawton, for **Beadlam Champion** 1435, bay, bred by George Elders, Aislaby, Whitby; *s.* Pitch and Toss 1204, *d.* Lady Stainthorpe 718 *by* Lord Hillingdon 986.

162 **III.** (£5.)—F. Wilson Horsfall, Potto Grange, Northallerton, for **Smylett Marquis** 1470, bay, bred by W. D. Petch, Smylett Hall, Pocklington; *s.* The Marquis 1407, *d.* Trinket 661 *by* Sportsman 299.

166 **R. N.**—George Scoby, for **The Turk.**

Class 16.—*Cleveland Bay Mares (with Foals at foot).* [6 entries, 1 absent.]

168 **I.** (£15.)—George Elders, Toft House Farm, Aislaby, Whitby, for **Lady Stainthorpe** 718, bay, foaled 1890 [foal *by* Pitch and Toss 1204], bred by F. Stainthorpe, Hawsker, Whitby; *s.* Lord Hillingdon 986, *d.* Lucy 405 *by* Barnaby 18.

171 **II.** (£10.)—Henry C. Stephens, M.P., Cholderton, Salisbury, for **Fanny Drake** 169, bay, foaled 1880 [foal *by* Marston 1080], bred by Andrew Moscrop, Sparrow Park, Marske-by-Sea; *s.* Fidius Dius 107, *d.* *by* Duke of Cleveland 96.

167 **III.** (£5.)—Earl of Carnarvon, Highclere Castle, Newbury, for **Careless** 681, bay, foaled 1890 [foal *by* Sultan 667], bred by John Ward, Barrowby, Hinderwell, Yorks; *s.* Reform 653, *d.* *by* Barnaby 18.

170 **R. N.**—Alfred E. Pease, M.P., for **Bonny Heather.**

Class 17.—*Cleveland Bay Fillies, foaled in* 1895 *or* 1896. [7 entries, 1 absent.]

179 **I.** (£15.)—Henry C. Stephens, M.P., Cholderton, Salisbury, for **Sultana** 1008, bay, foaled 1895; *s.* Sultan 667, *d.* Beauty 5 *by* Prince Frederick.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

176 **II.** (£10.)—ANDREW MOSCROP, Sparrow Park, Marske-by-Sea, for **Cleveland Duchess**, bay, foaled 1896; *s.* Hyllus 969, *d.* Dashaway 612 *by* Fidius Dius 107.

174 **III.** (£5.)—F. WILSON HORSFALL, Potto Grange, Northallerton, for **Lady Salton** 1068, bay, foaled 1896, bred by Henry C. Stephens, M.P., Cholderton, Salisbury; *s.* Luck's All 189, *d.* Countess of Salton 315 *by* Fidius Dius 107.

175 **R. N. & H. C.**—F. WILSON HORSFALL, for **Success.**

173 **H. C.**—F. P. BAKER, for **Ingmanthorpe Empress.**

178 **Com.**—HENRY C. STEPHENS, M.P., for **Blackthorn.**

Coach Horses.

Class 18.—*Coaching Stallions, foaled in* 1895.
[4 entries, none absent.]

180 **I.** (£15.)—GEORGE BURTON, Thorpe Willoughby, Selby, for **Prince Risby** 2206, bay, bred by John Parker, Cottingwith; *s.* Lord Risby 1402, *d.* Lady Ida 78 *by* Risby 404.

182 **II.** (£10.)—SILVESTER LEAF, Glade Farm, Escrick, York, for **Victor's Prince**, bay; *s.* Prince Victor 376, *d.* Frolicsome 423 *by* Fidius Dius 1592.

181 **III.** (£5.)—ROBERT KITCHING, Hungate, Pickering, for **Granite 2205**, bay, bred by Booth Bros., Ugthorpe, Whitby; *s.* Prince George 367 Y.C.S.B., *d. by* Rillington Lord 1020 C.B.S.B.

183 **R. N.**—JOHN LETT, Rillington, York, for **The Favourite.**

Class 19.—*Coaching Stallions, foaled in* 1896.
[4 entries, none absent.]

184 **I.** (£15.)—HICKMAN & SCUTT, Swinefleet, Goole, for **Partners** (late Prince of Wales II.), bay; *s.* Prince Victor 376, *d.* Patience 118 *by* Cyrus 113.

186 **II.** (£10.)—W. ROOK, Rookbarugh, Kirby Moorside, for **Noble Prince**, bay, bred by Silvester Leaf, Glade Farm, Escrick; *s.* Prince Victor 376, *d.* Frolicsome 423 *by* Fidius Dius 1592.

185 **III.** (£5.)—JOSEPH READER, Beacon Stud Farm, Holme, Yorks, for **Beacon Jubilee**, bay; *s.* Prince Victor 376, *d.* Lady Beacon 71 *by* Yorkshireman 918.

187 **R. N.**—GEORGE SCOBY, Beadlam Grange, Nawton, for **Beadlam Sportsman.**

Class 20.—*Coaching Mares (with Foals at foot).*
[5 entries, none absent.]

190 **I.** (£15.)—E. & R. DUTTON, New Parks, Skipton, Yorks, for **Bilton Countess**, bay, foaled 1894 [foal *by* Lord Risby 1402]; *s.* Prince Victor 376, *d.* May Day 101 *by* Candidate 64.

192 **II.** (£10.)—GEORGE SCOBY, Beadlam Grange, Nawton, Yorks, for **Princess Georgie**, bay, foaled 1894 [foal *by* Beadlamite 1368], bred by W. H. S Pyman, Moss Brow, Whitby; *s.* Prince George 367 Y.C.S.B., *d.* Fanny *by* Newton 216 C.B.S.B.

188 **III.** (£5.)—FRANCIS P. BAKER, Ingmanthorpe Grange, Wetherby, for **Ingmanthorpe Dora II.**, bay, foaled 1894 [foal *by* Ingmanthorpe Duke 1398]; *s.* Sandboy 1317 C.B.S.B., *d.* Ingmanthorpe Dora 438 *by* Prince George 367.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 21.—*Coaching Fillies, foaled in* 1895 *or* 1896.
[5 entries, 2 absent.]

194 I. (£15.)—E. & R. DUTTON, New Parks, Skipton, Yorks, for **Princess Annie**, bay, foaled 1895; *s.* Prince Victor 376, *d.* Georgiana 1st 424 *by* Prince George 367.

193 II. (£10.)—EDWARD CONNELL, Heslington, York, for **Primrose Queen**, bay, foaled 1895; *s.* Prince Victor 376, *d.* Lady Favourite 254 *by* Leverton 735 C.B.S.B.

197 R. N.—GEORGE SCOBY, Beadlam Grange, Nawton, for **Lady Ugthorpe**.

Hackneys.

Class 22.—*Hackney Stallions, foaled in* 1895, *above* 15 *hands.*
[10 entries, 1 absent.]

200 I. (£15, & Champion.[1])—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Gay Danegelt** 6022, chestnut; *s.* Danegelt 174, *d.* Genista 2775 *by* Cadet 1251.

205 II. (£10, & R. N. for Champion.[1])—WHITWORTH & MITCHELL, Warley Stud, Southwood, Halifax, for **Edemynag** 5989, bay, bred by Tom Mitchell, The Park, Eccleshill; *s.* Ganymede 2076, *d.* Lady Dudley 4067 *by* Monarch.

207 III. (£5.)—J. & H. P. WEBSTER, Stud Farm, Brompton, R.S.O., Yorks, for **Matchless of Brompton** 6129, brown; *s.* Fireaway 5th 4767, *d.* Silvertail 2455 *by* Matchless of Londesboro' 1517.

202 R. N. & H. C.—LEES KNOWLES, M.P., Pendlebury, for **Successor**.
Com.—J. D. CHARRINGTON, for No. 198, **Royal Duke**; ALFRED LEWIS, for No. 203, **Master Cream**; C. ARTHUR PEARSON, for No. 206, **Matchless of Knowle**.

Class 23.—*Hackney Stallions, foaled in* 1895, *above* 14 *hands and not exceeding* 15 *hands.* [3 entries, 1 absent.]

209 I. (£15.)—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Gay Connaught** 6020, chestnut; *s.* Connaught 1453, *d.* Dorothy 2016 *by* Lord Derby 2nd 417.

210 R. N. & H. C.—GOODMAN ROOT, Beckwith Lodge, Harrogate, for **Balm**.

Class 24.—*Hackney Stallions, foaled in* 1896.
[11 entries, 4 *absent.*]

215 I. (£15.)—THOMAS HALL, East Farm, Langton, Malton, for **Langton Masher**, bay; *s.* Garton Duke of Connaught 3009, *d.* Langton Charity 6986 *by* Lord Garraby 2nd 3747.

214 II. (£10.)—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Danish Duke** 6329, chestnut, bred by F. Wrench, Killacoona, Ballybrack, Dublin; *s.* Clovelly 4690, *d.* Park House Duchess 5966 *by* Prince Alfred 1325.

220 III. (£5.)—FREDERICK WRENCH, Killacoona, Ballybrack, Dublin, for **King Clovis**, chestnut, bred by Congested Districts Board, Dublin; *s.* Clovelly 4690, *d.* Queeney 6066 *by* Prince Alfred 1325.

221 R. N. & H. C.—FREDERICK WRENCH, Killacoona, for **Silver Dane**.
H. C.—THOMAS SMITH, for No. 218, **Umberto**; J. W. TEMPLE, for No. 219, **Discord 2nd**.

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[1] Gold Medal given by the Hackney Horse Society for the best Hackney Stallion in Classes 22-25.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 25.—*Hackney Stallions, foaled in* 1897. [16 entries, 8 absent.]

235 I. (£15.)—THE HORSLEY STUD Co., Cobham, Surrey, for **Horsley Duke of Connaught**, roan; *s.* Garton Duke of Connaught 3009, *d.* Maudess 3045 *by* Hue and Cry Shales 379.

230 II. (£10.)—A. W. HICKLING, Adbolton, Nottingham, for **Adbolton Squire**, bay; *s.* Ganymede 2076, *d.* Mascotte (late Meliora) 1706 *by* Confidence 158.

236 III. (£5.)—GEORGE WILSON, Garton, Driffield, for **Rodasor**, chestnut, bred by Exhibitor and E. T. Barber, Haverfield, Patrington; *s.* Rosador 4964, *d.* Garton Primrose 7905 *by* Garton Denmark 3618.

228 R. N. & H. C.—SIR GILBERT GREENALL, BT., for **Pure Gold.**
H. C.—JOHN BARKER, for No. 222, **Foxdale**; J. D. CHARRINGTON, for No. 224, **Destiny.**

Class 26.—*Hackney Mares (with Foals at foot), above* 15 *hands.* [11 entries, 1 absent.]

247 I. (£15, & Champion.[1])—WALTER WATERHOUSE, Starborough Stud Farm, Edenbridge, Kent, for **Bury Daisy** 5095, chestnut, foaled 1891 [foal *by* Garton Duke of Connaught 3009], bred by John Rowell, Manor Farm, Bury, Hunts; *s.* Contest 1746, *d.* Eclipse 92 *by* Lord of the Manor 426.

240 II. (£10, & R. N. for Champion.[1])—AUSTIN C. CARR, Broxton, Cheshire, for **Ada Rufus** 4955, chestnut, foaled 1891 [foal *by* Elevator 5599], bred by John Atkinson, High Field, Garton, Yorks; *s.* Rufus 1343, *d.* Amelia 1423 *by* Danegelt 174.

243 III. (£5.)—HARRY LIVESEY, Rotherfield, Sussex, for **Eone** 7832, bay, foaled 1893 [foal *by* Stowmarket]; *s.* All Fours 1241, *d.* Lily 219 *by* Lord Derby 2nd 417.

246 R. N. & H. C.—J. W. TEMPLE, Leyswood, Groombridge, for **Lady Dereham.**
H. C.—GEORGE BULLOUGH, for No. 238, **Graceful**; LEES KNOWLES, M.P., for No. 241, **Activity**; C. ARTHUR PEARSON, for No. 245, **Martha.**
Com.—GEORGE BULLOUGH, for No. 239, **Tornado**; LEES KNOWLES, M.P., for No. 242, **Elegant**; JOHN MAKEAGUE, for No. 244, **Carnation.**

Class 27.—*Hackney Mares (with Foals at foot), above* 14 *hands and not exceeding* 15 *hands.* [6 entries, 3 absent.]

249 I. (£15.)—JOHN BARKER, The Grange, Bishop's Stortford, for **Isoline** 9003, chestnut, foaled 1891 [foal *by* Agility 2799], bred by Joseph Morton, Stow, Downham, Norfolk; *s.* Anconeus 2nd 1975, *d.* Minnie 2308 *by* Cadet 1251.

250 II. (£10.)—F. E. COLMAN, Nork Park, Epsom, for **Moonlight** 4435, black, foaled 1888 [foal *by* Royal Danegelt 5785], bred by F. Crisp, Hall Farm, Eccles, Norfolk; *s.* Old Times 1863, *d. by* Shepherd F. Knapp 762.

251 III. (£5.)—A. W. HICKLING, Adbolton, Nottingham, for **Fair Confidence** 3749, bay, foaled 1889 [foal *by* Ganymede 2076], bred by Lionel Rodwell, Bagthorpe Hall, Norfolk: *s.* Confidence 158, *d.* Jessie No. 273 Inspected F.S. *by* Model 1054.

Class 28.—*Hackney Fillies, foaled in* 1896. [8 entries, 3 absent.]

256 I. (£15.)—F. W. BUTTLE, Hackney Stud Farm, Rillington, York, for **Grand Mistress** 10992, chestnut, bred by the Earl of Londesborough; *s.* Grand Master 2nd 5230, *d.* Kitchen Maid 1159 *by* King Charley 392.

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[1] Gold Medal given by the Hackney Horse Society for the best Hackney Mare or Filly exhibited in Classes 26–29.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

255 **II.** (£10.)—JOHN BARKER, The Grange, Bishop's Stortford, for **Lady Millie** 1153, chestnut; *s.* Agility 2799, *d.* Lady Mildred 9147 *by* Danegelt 174

262 **III.** (£5.)—J. F. RICHARDSON, Norton Lodge, Malton, for **Rosadora** 11437, chestnut roan; *s.* Rosador 4964, *d.* Wild Daisy 6311 *by* Wildfire 1224.

257 **R. N. & H. C.**—J. D. CHARRINGTON, Roehampton, for **Danegelta.**

260 **Com.**—THE MARQUIS OF LONDONDERRY, K.G., for **Lightheart.**

Class 29.—*Hackney Fillies, foaled in* 1897. [18 entries, 3 absent.]

263 **I.** (£15.)—AUSTIN C. CARR, Broxton, Cheshire, for **Chocolate Girl**, chestnut, bred by George Wilson, Garton, Driffield; *s.* Chocolate Junior 4185, *d.* Yellar Gal 3388 *by* Matchless of Londesboro' 1517.

276 **II.** (£10.)—DAVID MITCHELL, Millfield, Polmont, Stirling, for **Polonia**, chestnut; *s.* Polonius 4931, *d.* Filbert 2060 *by* The Colonel 149.

280 **III.** (£5.)—WALTER WATERHOUSE, Starborough Stud Farm, Edenbridge, Kent, for **Sudden**, chestnut; *s.* Garton Duke of Connaught 3009, *d.* Surprise 3299 *by* Ritualist 1542.

278 **R. N. & H. C.**—JOHN ROBINSON, Hedon, Hull, for **Enid.**

H. C.—H. B. CORY, for No. 265, **Druidstone Dorothy**, and No. 266, **Druidstone Duchess.**

Com.—SIR GILBERT GREENALL, BT., for No. 271, **Ring O'Bell**; THE HORSLEY STUD CO., for No. 273, **Cathedra.**

Class 30.—*Hackney Mares or Geldings, above* 14 *hands,* 15 *stone and upwards, foaled in* 1891, 1892, 1893, *or* 1894.[1] [2 entries.]

282 **I.** (£15.)—S. B. CARNLEY, Alford, Lincs, for **Norbury Lordling**, bay gelding, foaled 1893, bred by Samuel Fisher, Hedon, Hull; *s.* Lord Denby 2nd 3092, *d.* Mignonette 4348 *by* Confidence 163.

281 **R. N. & H. C.**—F. J. BATCHELOR, Alvechurch, Worcester, for **Lord Hopwood.**

Class 31.—*Hackney Mares or Geldings, above* 14 *hands,* 12 *to* 15 *stone, foaled in* 1891, 1892, 1893 *or* 1894.[1] [7 entries, 4 absent.]

285 **I.** (£15.)—ARTHUR E. EVANS, Bronwylfa, Wrexham, for **Sonata** 10516, bay mare, bred by W. H. Richardson, Ganstead, Hull; *s.* Saxon 2674, *d.* Nana 3121 *by* Lord Derby 2nd 417.

288 **II.** (£10.)—C. ARTHUR PEARSON, Frensham Place, Farnham, Surrey, for **Frensham Squire**, chestnut gelding, foaled 1894, bred by G. M. Gale, Atwick Hall, Seaton, Hull; *s.* Houndales 3047, *d.* Lady Mary of Atwick 4146 *by* Danegelt 174.

289 **III.** (£5.)—J. & H. P. WEBSTER, Brompton, R.S.O., Yorks, for **Lofty Lady** (late Grimston Silver) 7941, bay mare, foaled 1892, bred by George Richardson, North Grimston, Yorks; *s.* Garton Duke of Connaught 3009, *d.* Silvertail 2455 *by* Matchless of Londesboro' 1517.

Class 32.—*Hackney Mares or Geldings, foaled in* 1895.[1] [11 entries, 4 absent.]

292 **I.** (£15.)—C. E. GALBRAITH, Terregles, Dumfries, for **Vivandière** 10589, chestnut mare; *s.* Danebury 4724, *d.* Lady Preston 4166 *by* Wildfire 1224.

293 **II.** (£10.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Goldflash** 10006, chestnut mare, bred by W. Scott, Gilfoot, Carluke, N.B.; *s.* Goldfinder 6th 1791, *d.* Flash 2752 *by* Confidence 163.

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[1] Prizes given by the Birmingham Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

291 III. (£5.)—C. E. GALBRAITH, for **Trilby** 10568, chestnut mare; *s.* Danebury 4724, *d.* Lund Lassie 4262 *by* Danegelt 174.

296 R. N. & H. C.—R. HUSSEY, Eastfields, Lichfield, for **Atwick Florrie.**
H. C.—THE HORSLEY STUD CO., for No. 294, **Elegance**; JOHN ROBINSON, for No. 297, **Wild Agnes.**

299 Com.—RALPH SNEYD, for **Gardenia.**

Ponies.

Class 33.—*Pony Stallions, not exceeding* 14 *hands.* [8 entries, none absent.]

306 I. (£15.)—WILLIAM HOLLINS, Pleasley Vale, Mansfield, Notts, for **Confident George**, black, foaled 1895; *s.* Portwood Confidence 3201, *d.* Georgina 6th 7915 *by* Little Wonder 2nd 1610.

307 II. (£10.)—J. MAKEAGUE, Golborne Park, Newton-le-Willows, Lancs, for **Pomposity** 6502, bay, foaled 1895; *s.* Berkeley Model (late Heacham Model) 3663, *d.* Bravo No. 1036 Inspected F.S.

304 III. (£5.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Sir Baldic** 5814, chestnut, foaled 1894, bred by J. McMeeken, Carnbooth, Busby, N.B.; *s.* Goldfinder 6th 1791, *d.* Polly 393 *by* Fireaway 249.

308 R. N. & H. C.—THOMAS P. SCOBY, Sinnington, Yorks, for **Hexham.**

Class 34.—*Pony Mares (with Foals at foot), not exceeding* 14 *hands.* [9 entries, 2 absent.]

312 I. (£15.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Georgina 5th** 8921, bay, foaled 1890 [foal *by* Sir Horace 5402], bred by C. W. Wilson, Rigmaden Park, Kirkby Lonsdale; *s.* Sir George 778, *d.* Georgina 2nd 3851 *by* Sir George 778.

315 II. (£10.)—WILLIAM HOLLINS, Pleasley Vale, Mansfield, Notts, for **Windsor Snorer** 8583, bay, foaled 1889 [foal *by* Prospector 6516], bred by C. W. Wilson, Rigmaden Park, Kirkby Lonsdale; *s.* Sir George 778, *d.* Snorer 2456 *by* Sir George 778.

310 III. (£5.)—ALFRED S. DAY, Berkeley Stud, near Crewe, for **Magic** No. 965 Inspected F. S., brown, foaled 1888 [foal *by* Berkeley Model, late Heacham Model 3663], bred by R. Clark, Tacolnestone, Norfolk; *s.* Colt *by* Dr. Syntax 877, *d.* Topsy No. 1100 Inspected F.S. *by* Prickwillow 1100.

309 R. N. & H. C.—JOHN CONCHAR, Wylde Green, Birmingham, for **Pansy.**

314 H. C.—WILLIAM HOLLINS, for **Something Slap II** 9528, bay, foaled 1891 [foal *by* Prospector 6516], bred by Robert Rivett, Southborough, Thetford: *s.* Surgeon 4541, *d.* Little Gem 962 F.S.

Class 35.—*Pony Colts, Geldings, or Fillies, foaled in* 1896, *the produce of Mares registered in or accepted by inspection for the Hackney Society's Stud Book as Ponies.*[1] [7 entries, none absent.]

318 I. (£15.)—CAPT. CLIFFORD CULLEN, Kirkby House, Notts, for **Greeta** 10995, chestnut filly; *s.* Grand Cadet 4797, *d.* Rita 5416 *by* Rarey 1883.

324 II. (£10.)—THE MARQUIS OF LONDONDERRY, K.G., Seaham Hall, Durham, for **Snowstorm** 11485, grey roan filly; *s.* Little Wonder 2nd 1610, *d.* Snowdrop No. 1093 Inspected F.S.

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[1] Prizes given by the Birmingham Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

323 **III.** (£5.)—WILLIAM HOLLINS, Pleasley Vale, Mansfield, Notts, for bay filly, bred by Sir H. F. de Trafford, Bt., North Walsham, Norfolk; *s.* Snorter 4095, *d.* Sugar Candy *by* Star of the West 3rd 3981.

322 **R. N. & H. C.**—WILLIAM HOLLINS, for **Grunter.**

320 **H. C.**—A. H. GREATBATCH, for **Doncaster Surprise.**

Class 36.—*Pony Colts, Geldings, or Fillies, foaled in* 1897, *the produce of Mares registered in or accepted by inspection for the Hackney Society's Stud Book as Ponies.*[1] [10 entries, 1 absent.]

332 **I.** (£15.)—FRANK RILEY SMITH, Saxham Hall, Bury St. Edmunds, for brown colt; *s.* Lord Hamlet 3750, *d.* Belle of the Wharfe 8669 *by* Tuddenham Wonder 2742.

327 **II.** (£10.)—WILLIAM HOLLINS, Pleasley Vale, Mansfield, Notts, for bay filly; *s.* Prospector 6516, *d.* Miss Sniff 11316 *by* Cassius 2397.

334 **III.** (£5.)—S. WOODIWISS, Sedgemere, Finchley, for **Lady Star**, bay filly; *s.* Morning Star 4th 3818, *d.* Lady Model 8113 *by* Model 1054.

330 **R. N. & H. C.**—JOHN JONES, Colwyn Bay, for **Miss Cassius.**

329 **H. C.**—WILLIAM HOLLINS, for bay colt; *s.* Prospector 6516, *d.* Lady Eastcote 8050 *by* Sir George 778.

Class 37.—*Pony Mares or Geldings, under* 13 *hands, foaled in* 1892, 1893 *or* 1894.[1] [8 entries, none absent.]

339 **I.** (£10.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Merry Star** 9299, brown mare, foaled 1894, bred by James McMeeken, Carnbooth, Busby, N.B.; *s.* Sir John 3280, *d.* Merry Polly 8250 *by* Merry Sunshine 1523.

341 **II.** (£5.)—WILLIAM HOLLINS, Pleasley Vale, Mansfield, Notts, for **Jenny Jones** No. 1222 Inspected F.S., bay mare, foaled 1892, bred by Mr. Ainge, Metchley, Edgbaston, Birmingham; *s.* Winnal George (late Disappointment) 2210, *d.* Welsh pony.

342 **R. N. & H. C.**—E. JONES, for **Myfanwy.**

340 **H. C.**—WILLIAM HOLLINS, for **Eva Jones.**

Com.—W. C. CROPPER, for No. 335, **Nicotine**; W. R. FLOWER, for No. 336, **Chatterbox**; W. FOSTER, for No. 337, **Dandy.**

Mountain and Moorland Ponies.

(Including Dartmoor, Exmoor, New Forest, Shetland and Welsh Breeds.)

Class 38.—*Stallions, foaled before or in* 1894, *not exceeding* 12 *hands* 2 *inches.* [9 entries, none absent.]

345 **I.** (£15.)—H. MEURIC LLOYD, Glanyrannell, Llanwrda, R.S.O., Carmarthenshire, for **Starlight**, grey, foaled 1891; *s.* Glassallt, *d.* Moonlight.

347 **II.** (£10.)—T. E. MCCONNELL, Innisfallen, Annadale, Belfast, for **Matchless**, red roan, foaled 1892.

343 **III.** (£5.)—ROBERT BETTINSON, Three Holes, Wisbech, for **Tomboy** 6597, bay, foaled 1894; *s.* Lord Nordelph 6459, *d.* Pop Them Up No. 1256 Inspected F.S.

344 **R. N. & H. C.**—THE LADIES E. AND D. HOPE, for **Oman.**

346 **H. C.**—THE MARQUIS OF LONDONDERRY, K.G., for **Rocket 6th.**

[1] Prizes given by the Birmingham Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor"]

Class 39.—*Mares foaled before or in* 1894, *not exceeding* 12 *hands* 2 *inches.* [14 entries, none absent.]

364 I. (£15.)—THE DUCHESS OF NEWCASTLE, Clumber, Worksop, for **Lady White**, white, foaled 1890.

353 II. (£10.)—LORDS A. AND L. CECIL, Orchardmains, Tonbridge, for **Crescent**, bay, aged, bred by S. Biddlecombe, Beaulieu Rails, Southampton.

360 III. (£5.)—MRS. WENTWORTH HOPE-JOHNSTONE, Can Hatch, Banstead, Surrey, for **Skylark**, black, foaled 1893, bred by The Marquis of Londonderry, K G., Bressay, Shetland; *s.* Lord of the Isles 26, *d.* Scada 674 *by* Lord of the Isles 26.

358 R. N. & H. C.—THE LADIES E. AND D. HOPE, for **Hoplemuroma.**

Polo Ponies.

Class 40.—*Polo Pony Stallions, not exceeding* 14 *hands* 2 *inches.*[1] [9 entries, none absent.]

367 I. (£20, & Champion.[2])—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Rosewater** 37, bay, foaled 1883, bred by Mr. Elphick, Preston Park, Brighton; *s.* Rosicrucian, *d.* Lady Day II. *by* Saint Mungo.

366 II. (£10.)—JOHN BARKER, The Grange, Bishop's Stortford, for **Sandiway**, bay, foaled 1895, bred by Sir H. F de Trafford, Bt., Hill Crest, Market Harborough; *s.* Rosewater 37, *d.* Cuddington 50 *by* Cucumber.

371 III. (£5.)—J. HENRY STOCK, M.P, White Hall, Tarporley, for **Royal Salute**, brown, foaled 1894; *s.* Sentinel, *d.* Zither *by* Marlbrouk.

367A R. N.—THE HORSLEY STUD CO., Cobham, Surrey, for **Gownboy**, chestnut, bred by S. Hewitt, St. James's Club, S.W.; *s.* Montezuma, *d* Santa Zita *by* Galliard.

Class 41.—*Polo Pony Stallions (Eastern Ponies), not exceeding* 14 *hands* 2 *inches.*[1] [3 entries.]

376 I. (£15, & R. N. for Champion.[2])—G. NORRIS MIDWOOD, The Hut, Tabley, Knutsford, for **The Bey** 108, bay, foaled 1886; *s.* Tahoive.

374 II. (£10.)—STUART FORSTER, Postlip Hall, Winchcombe, Glos., for **Mootrub** 34, chestnut, foaled 1886, breeder unknown.

375 R. N.—E. JONES, Manoravon, Llandilo, for **Akbar.**

Class 42.—*Polo Pony Stallions, not exceeding* 13 *hands* 2 *inches.*[1] [3 entries.]

377 I. (£15.)—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Lord Polo**, chestnut, foaled 1893, bred by Sir H. F. de Trafford, Bt., Hill Crest, Market Harborough; *s.* Rosewater 37, *d.* Lady Florence 142.

379 II. (£10.)—G. NORRIS MIDWOOD, The Hut, Tabley, Knutsford, for **Hurlingham** 90, chestnut, foaled 1894, bred by Sir H. F. de Trafford, Bt, Flordon, Norfolk; *s* Rosewater 37, *d.* Esmeralda 67.

378 R. N.—JOHN JONES, Colwyn Bay, for **Young Caradoc.**

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[1] Prizes given by the Birmingham Local Committee.
[2] Gold Medal given by the Polo Pony Society for the best Polo Pony Stallion in Classes 40–42.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 43.—*Polo Pony Mares, above* 13 *hands* 2 *inches and not exceeding* 14 *hands* 2 *inches, with Foals at Foot or to Foal in* 1898.[1] [9 entries, 1 absent.]

380 I. (£20, & Champion.[2])—SIR H. F. DE TRAFFORD, BT., Hill Crest, Market Harborough, for **Confidential**, bay, foaled 1893 [foal *by* Rosewater 37]; *s.* Rosewater 37, *d.* The Secret 287.

384 II. (£10.)—G. NORRIS MIDWOOD, The Hut, Tabley, Knutsford, for **Shy Lass** 264, bay, foaled 1889 [foal *by* Hurlingham 90], breeder unknown; *s.* Albert Victor.

383 III. (£5.)—THE KEYNSHAM STUD CO., Keynsham, Som., for **Oh My** 425, dark chestnut, foaled 1879 [foal *by* Royalty], bred by W. Bowers, Woodside Cottage, Nantwich; *s.* Belgrave, *d.* Corwen Fanny.

385 R. N.—THE REV. D. B. MONTEFIORE, Mursley, Winslow, for **Lollipop**.

Class 44.—*Polo Pony Mares, not exceeding* 13 *hands* 2 *inches, with Foals at Foot or to Foal in* 1898.[1] [6 entries, 1 absent.]

391 I. (£15, & R. N. for Champion.[2])—WILLIAM HOLLINS, Pleasley Vale, Mansfield, Notts, for **Snorter II.** 8461, bay, foaled 1893 [foal *by* Prospector 6516], bred by Sir H. F. de Trafford, Bt., Flordon, Norfolk; *s.* Cassius 2397, *d.* Snorer II. 4703 *by* Sir George 778.

390 II. (£10.)—WILLIAM HOLLINS, for **Peggy** 11364, brown, foaled 1893 [foal *by* Prospector 6516]; *s.* Little Wonder II. 1610, *d.* Polly Perkins 8370 *by* Sir George 778.

393 III. (£5.)—J. H. STOCK, M.P., White Hall, Tarporley, for **Zither** 473, dark chestnut [foal *by* Sentinel], breeder unknown; *s.* Marlbrouk, *d.* La Harpe.

389 R. N.—FREDERICK R. HILL, Church Stretton, for **Quiz**.

Class 45.—*Polo Pony Colts, Geldings, or Fillies, foaled in* 1895, *not exceeding* 14 *hands* 1 *inch.*[1] [11 entries, 3 absent.]

404 I. (£10.)—THOMAS JAMES, Vineyards Farm, Charlton Kings, Cheltenham, for **Beatrice**, brown filly; *s.* Royal Fern, *d.* Beauty *by* Waddington.

395 II. (£7.)—JOHN BARKER, The Grange, Bishop's Stortford, for **Rosebrecon**, bay filly, bred by John Hill, Felhampton Court, Church Stretton; *s.* Brecon Prince, *d.* Roseleaf 251 *by* Bombay Chief.

398 III. (£3.)—SIR H. F. DE TRAFFORD, BT., Hill Crest, Market Harborough, for **Johnnie**, grey gelding; *s.* Sir Robert 41, *d.* Esmeralda 67.

405 R. N. & H. C.—G. NORRIS MIDWOOD, Tabley, Knutsford, for **Shy Boy**.

401 H. C.—MISS A. GORE-BOOTH, for **Arab Star**.

Class 46.—*Polo Pony Colts, Geldings, or Fillies, foaled in* 1896, *not exceeding* 14 *hands.*[1] [7 entries, none absent.]

406 I. (£10.)—JOHN BARRON, Elvaston House, Borrowash, Derby, for **Juliet**, grey filly; *s.* Grey Dawn, *d.* Daisy.

413 II. (£7.)—J. HENRY STOCK, M.P., White Hall, Tarporley, for **Stella**, brown filly; *s.* Sentinel, *d.* Zither *by* Marlbrouk.

412 III. (£3.)—G. NORRIS MIDWOOD, The Hut, Tabley, Knutsford, for **Shy Lad**, chestnut colt; *s.* Sir Robert 41, *d.* Shy Lass 264 *by* Albert Victor.

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[1] Prizes given by the Birmingham Local Committee.
[2] Gold Medal given by the Polo Pony Society for the best Polo Pony Mare in Classes 43 & 44.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

408 R. N. & H. C.—WILLIAM HOLLINS, Pleasley Vale, Mansfield.
407 H. C.—FREDERICK R. HILL, for Grey Goose.

Class 47.—*Polo Pony Colts, Geldings, or Fillies, foaled in* 1897.[1] [12 entries, none absent.]

418 I. (£10.)—WILLIAM HOLLINS, Pleasley Vale, Mansfield, for brown filly; *s.* Snorter 4995, *d.* Georgina II. 3851 *by* Sir George 778.

414 II. (£7.)—STUART FORSTER, Postlip Hall, Winchcombe, for chestnut colt; *s.* Mootrub 34, *d.* Sally.

419 III. (£3.)—WILLIAM HOLLINS, for brown colt; *s.* Snorter 4995, *d.* Georgina 2088 *by* Sir George 778.

421 R. N. & H. C.—THE MARQUIS OF LONDONDERRY, K.G., for Walnut.
H. C.—MAJOR HENRIQUES, R.A., for No. 415, **Blucher**; THE KEYNSHAM STUD CO., for No. 420, **Manchester Royal**; J. WILKINSON, for No. 425, **Hermit.**

Class 48.—*Polo Pony Mares or Geldings, foaled before or in* 1894, *above* 13 *hands* 2 *inches and not exceeding* 14 *hands* 2 *inches.*[1] [6 entries, 1 absent.]

426 I. (£20.)—JOHN BARKER, The Grange, Bishop's Stortford, for **Silvertail**, bay roan mare, foaled 1892, bred by J. R. Gilroy, 19 Grosvenor Gardens, S.W.; *s.* Low-water.

430 II. (£10.)—THE KEYNSHAM STUD CO., Keynsham, Som., for **Game Chicken**, chestnut gelding, foaled 1894, bred by the late J. H. Clifton, The Uplands, Keynsham; *s.* Steeton Pride 3983, *d.* Oh My 425 *by* Belgrave.

429 III. (£5.)—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Bright Pearl**, bay mare, foaled 1894, bred by G. A. Winstone, 19 Gross Street, E.C.; *s.* Pearl Diver.

Class 49.—*Polo Pony Mares or Geldings, foaled before or in* 1894, *not exceeding* 13 *hands* 2 *inches.*[1] [3 entries.]

432 I. (£15.)—JOHN BARKER, The Grange, Bishop's Stortford, for **Jeanie**, chestnut mare, aged, breeder unknown.

433 II. (£10.)—CHARLES WILLIAMS, Manor House, Little Rollright, Chipping Norton, for **Chip**, bay mare, foaled 1889, breeder unknown.

434 R. N. & H. C.—CHARLES WILLIAMS, for **Little Nipper.**

Harness Horses and Ponies.

Class 50.—*Harness Mares or Geldings, of any age, above* 14 *hands* 2 *inches.*[1] [14 entries, 4 absent.]

441 I. (£15.)—EDWARD S. GODSELL, Stroud, for **Lady Lofty** 5594, brown mare, foaled 1888, bred by J. Coker, Beetley Hall, East Dereham; *s.* White Stockings 1415, *d.* Beauty 16 *by* A1 1.

448 II. (£10.)—GEORGE C. WAUD, Ferniehurst, Baildon, Yorks, for **The Pure Thing**, grey gelding, foaled 1894, bred by J. G. Sykes, Poulton-le-Fylde; *s.* General Gordon 2084, *d.* Silver Gem *by* Grey Friar.

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[1] Prizes given by the Birmingham Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

445 III. (£5.)—W. J. MITCHELL, London Colney, Herts, for **Lord Clifford** (late Mephisto 3805), dark bay gelding, foaled 1889, bred by R. Haldenby, Peel St., Dewsbury; *s.* Golden Star 989, *d.* Brown Bell 1038 *by* Fireaway 249.

435 R. N. & H. C.—F. J. BATCHELOR, Alvechurch, Worcester, for **Gordina.**

437 H. C.—E. W. BRADBURY, for **Gipsy.**

439 Com.—J. CONCHAR, for **Royal Mail.**

Class 51.—*Harness Mares or Geldings of any age, above* 13 *hands and not exceeding* 14 *hands* 2 *inches.*[1] [19 entries, 4 absent.]

455 I. (£15.)—HARVEY DU CROS, JUN., Metchley House, Edgbaston, Birmingham, for **Metchley Squire**, chestnut gelding, foaled 1893, breeder unknown; *s.* Danegelt 174, *d. by* Lord Derby II. 417.

464 II. (£10.)—HERBERT T. PARKE, Withnell Fold, near Chorley, Lancs, for **Lady Love** (late Sadie) 9497, bay mare, foaled 1890; *s.* Neatmoor 1854, *d.* Lady Newton 2949 *by* Lord Balfour 412.

450 III. (£5.)—FRANK J. BATCHELOR, Hopwood Stud Farm, Alvechurch, Worcester, for **Lady Fancy II.** 5692, chestnut mare, foaled 1891, bred by J P. Case, Binham Abbey, Wighton; *s.* Cassius 2397, *d.* Sunset 397 *by* Little Wonder 409.

451 R. N. & H. C.—FRANK J. BATCHELOR, for **Sir Cassius.**

449 H. C.—ANDERTON & BULLOUGH, for **Cassius.**

Class 52.—*Harness Pony Mares or Geldings of any age, not exceeding* 13 *hands.*[1] [7 entries, 1 absent.]

473 I. (£10.)—GEORGE C. WAUD, Ferniehurst, Baildon, Yorks, for **Movement**, grey gelding, aged, breeder unknown.

469 II. (£5.)—WILLIAM HOLLINS, Pleasley Vale, Mansfield, Notts, for **Little Britannia** 1158, bay mare, foaled 1892, breeder unknown.

472 III. (£3.)—GEORGE C. WAUD, for **Amendment**, grey gelding, aged, breeder unknown.

471 H. C.—J. WOODS, for **Princess.** 470 Com.—W. J. MILTON, for **Castle Queen.**

Shires.

Class 53.—*Shire Stallions, foaled in* 1895. [14 entries, 2 absent.]

477 I. (£20.)—CAPT. W. H. O. DUNCOMBE, Waresley Park, Sandy, for **Waresley Triumph** 16453, bay; *s.* Duke of Worsley 13002, *d.* Policy 13154 *by* Lincolnshire Boy 3188.

482 II. (£10.)—P. ALBERT MUNTZ, M.P., Dunsmore, Rugby, for **Calwich Bridegroom** 16040, black, bred by J. W. Vondy, Grenaby, Bride, Isle of Man; *s.* Harold 3703, *d.* Great Rocks Lily 8140 *by* Lord Newark II. 6092.

478 III. (£5.)—EARL EGERTON OF TATTON, Tatton Park, Knutsford, for **Watnall Prince Harold 2nd** 16458, brown, bred by R. G. Hanson, Watnall, Notts; *s.* Prince Harold 14228, *d.* Watnall Belle 11215 *by* Advance 3419.

485 R. N. & H. C.—J. E. SHAW, Brooklands, Halifax, for **Prince of the Bush.**
Com.—THE CANNOCK AGRICULTURAL CO., LTD., for No. 475, **Brilliant 6th**; LORD ROTHSCHILD, for No. 484, **Royal Alfred II.**; W. & J. THOMPSON, for No. 487, **Cotheridge Swell.**

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[1] Prizes given by the Birmingham Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 54.—*Shire Stallions, foaled in* 1896. [11 entries, 4 absent.]

494 **I. (£20, & Champion.[1])**—ALEXANDER HENDERSON, M.P., Buscot Park, Faringdon, for **Buscot Harold** 16576, bay; *s.* Markeaton Royal Harold 15225, *d.* Aurea 13951 *by* Thornton Premier 12551.

492 **II. (£10, & R. N. for Champion.[1])**—JAMES EADIE, Barrow Hall, Derby, for **Barrow Darnley** 16510, bay, bred by Mrs. Slaney, Marston-on-Dove, Derby; *s.* Valesman of Willington 14913, *d.* Marston Princess *by* Albert Edward 5467.

495 **III. (£5.)**—SIR J. BLUNDELL MAPLE, BT, M.P., Childwickbury, St. Albans, for **Pioneer 7th** 16890, black, bred by A. E. S. Hepworth, Blackthorn, Bicester; *s.* Harold's Pilot 11564, *d.* Flower 23736 *by* Thumper XVII 17034.

498 **R. N. & H. C.**—J. WAINWRIGHT, Buxton, for **Rocks Commander.**
493 **H. C.**—EARL EGERTON OF TATTON, for **The Forest Chief.**
Com.—H.R.H. THE PRINCE OF WALES, K.G., for No. 489, **Ethelwulf**
ISAAC N. WOODIWISS, for No. 499, **Nalistone Bouncing Boy.**

Class 55.—*Shire Stallions, foaled in* 1897. [17 entries, 5 absent.]

506 **I. (£15.)**—J. P. CROSS, Catthorpe Towers, Rugby, for **Catthorpe Loyalty,** brown, bred by Col. H. Platt, Gorddinog, Bangor; *s.* Duke of Clarence II. 13001, *d.* Cronton Hopeful 14471 *by* King John IV. 11711.

511 **II. (£10.)**—LORD LLANGATTOCK, The Hendre, Monmouth, for **Hendre Conqueror,** bay; *s.* Prince Harold 14228, *d.* Nyn Lively 17136 *by* Hitchin William the Conqueror 7399.

508 **III. (£5.)**—JAMES EADIE, Barrow Hall, Derby, for **Barrow Sir James,** bay *s.* Harold 3703, *d.* British Queen 11764 *by* Bar None 2388.

500 **R. N. & H. C.**—H.R.H. THE PRINCE OF WALES, K.G., for **Draymaster.**
509 **Com.**—W. H. GODDING, for **Savernake Prince William.**

Class 56.—*Shire Mares (with foals at foot).* [20 entries, 6 absent.]

525 **I. (£20.)**—SIR J. BLUNDELL MAPLE, BT., M.P., Childwickbury, St. Albans, for **Dunsmore Cui Bono** 14653, brown, foaled 1891 [foal *by* Prince Harold 14228], bred by Joseph Salt, Upper Whittle, Longnor, Staffs.; *s.* Regent II. 6316, *d.* Berry *by* Lincolnshire Lad 1364.

519 **II. (£10.)**—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Whitstone Talent** 17610, bay, foaled 1892 [foal *by* Marmion II. 9885], bred by E. Mucklow, Whitstone Head; *s.* First Lord 7235, *d.* Duchess of Bridgewater III. 7946 *by* Shrewsbury 4681. (*Foal entered in Class* 58, *No.* 544.)

528 **III. (£5.)**—P. ALBERT MUNTZ, M.P., Dunsmore, Rugby, for **Embargo** 18172, chestnut, foaled 1893 [foal *by* Hitchin Conqueror 4458], bred by Myles Woodburne, Kirklands, Ulverston; *s.* Bar None 2388, *d.* Blagdon Beauty 4593 *by* Bonny Lad 3478.

532 **R. N. & H. C.**—JOHN PARNELL, Rainsbrook, Rugby, for **Waresley Maxima.**
H. C.—VICTOR C. W. CAVENDISH, M.P., for No. 518, **Melody**; ALEXANDER HENDERSON, M.P., for No. 522, **Asenath II.**; LORD LLANGATTOCK, for No. 524, **Lady Touch-Me-Not.**
Com.—ALEXANDER HENDERSON, M.P., for No. 523, **Twinkle**; PETER STUBBS, for No. 534, **Depper.**

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[1] Gold Medal given by the Shire Horse Society for the best Shire Stallion in Classes 53–55.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 57.—*Shire Colt Foals, foaled in* 1898, *the produce of Mares exhibited in Class* 56.[1] [6 entries, 3 absent.]

541 I. (£15.)—JOHN PARNELL, Rainsbrook, Rugby, for brown; *s.* Bold Harold 16005, *d.* Vulcan's Pride 21094 *by* Catthorpe Vulcan 12906. (*Exhibited with No.* 531.)

540 II. (£10.)—WILLIAM NEALE, Bacon's End, Coleshill, Birmingham, for bay; *s.* Coleshill Carbon 12893, *d.* Coleshill Belle 9697 *by* Royal Albert 1885. (*Exhibited with No.* 529)

537 R. N. & H. C.—VICTOR C. W. CAVENDISH, M.P, for **Holker Victor.**

Class 58.—*Shire Filly Foals, foaled in* 1898, *the produce of Mares exhibited in Class* 56.[1] [10 entries, 4 absent.]

544 I. (£15.)—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for bay; *s.* Marmion II. 9885, *d.* Whitstone Talent 17610 *by* First Lord 7235. (*Exhibited with No.* 519.)

550 II. (£10.)—JOHN PARNELL, Rainsbrook, Rugby, for bay; *s.* Calwich Prince 15531, *d.* Waresley Maxima 19078 *by* Hitchin Conqueror 4458. (*Exhibited with No.* 532.)

543 III. (£5.)—VICTOR C. W. CAVENDISH, M.P., Holker Hall, Carnforth, for **Holker Blanche**, bay; *s.* Stonewall 15375, *d.* Festive 14740 *by* Fear None 4394. (*Exhibited with No.* 517.)

546 R. N. & H. C.—LORD LLANGATTOCK, for **Hendre Fidget.**

Class 59.—*Shire Mares, foaled before or in* 1894, *not having foals at foot, but stinted in* 1898.[1] [8 entries, 2 absent.]

558 I. (£15, & R. N. for Champion.[2])—SIR J. BLUNDELL MAPLE, BT., M.P., Childwickbury, St. Albans, for **Miss Constance** 22168, bay, foaled 1894, bred by Makin Durham's Trustees, Thorne, Doncaster; *s.* Engineer II. 9300, *d.* Diamond 21653 *by* Royal Albert 1885.

557 II. (£10.)—ALEXANDER HENDERSON, M.P., Buscot Park, Faringdon, for **Gloaming** 18264, brown, foaled 1892, bred by C. E. Galbraith, Ayton Castle, N.B.; *s.* Twilight 13723, *d.* Gretna 6419 *by* Thumper 2136.

553 III. (£5.)—VICTOR C. W. CAVENDISH, M.P., Holker Hall, Carnforth, for **Nyn Starlight** 17139, black, foaled 1892, bred by Joseph Wainwright, Bowden Hall, Chapel-en-le-Frith; *s.* Bury Victor Chief 11105, *d.* Lincoln Lass 12770 *by* Lincolnshire Tom 1367.

556 R. N. & H. C.—W. T. EVERARD, Bardon, Leicester, for **Bardon Blackbird.**
554 H.C.—FRED CRISP, for **Comely Blagdon.**

Class 60.—*Shire Fillies, foaled in* 1895. [12 entries, 3 absent.]

570 I. (£15, & Champion[2])—LORD WANTAGE, K.C.B., V.C., Lockinge, Wantage, for **Hendre Crown Princess** 21896, brown, bred by John Thorley, Mayfield, Ashbourne; *s.* Prince Harold 14228, *d. by* President 3939.

563 II. (£10.)—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for **Saxon Heroine** 22416, bay; *s.* Tudor Harold 14380, *d.* Florrie 12339 *by* Electric.

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[1] Prizes given by the Birmingham Local Committee.
[2] Gold Medal given by the Shire Horse Society for the best Shire Mare or Filly in Classes 56 and 59–62.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

565 III. (£5.)—LORD LLANGATTOCK, The Hendre, Monmouth, for **Dunsmore Gazelle** 21705, bay, bred by P. Albert Muntz, M.P.; *s.* Dunsmore Willington Boy 13021, *d.* Dunsmore Bracelet 12197 *by* The Boy 3358.

561 R. N. & H. C.—SIR JAMES BLYTH, BT., for **Blythwood Guelder Rose.**

Class 61.—*Shire Fillies, foaled in* 1896. [16 entries, 7 absent.]

578 I. (£15.)—JAMES EADIE, Barrow Hall, Derby, for **Barrow Lassie** 22852, brown; *s.* Rokeby Harold 15313, *d.* Horninglow Beauty 16802 *by* Albert Edward 5467.

577 II. (£10.)—CAPT. W. H. O. DUNCOMBE, Waresley Park, Sandy, for **Boro' Royal** 23089, brown, bred by B. Brown, Thorney, Peterborough; *s.* The Colonel V. 10617, *d.* Fanny *by* Chancellor 4959.

574 III. (£5.)—VICTOR C. W. CAVENDISH, M.P., Holker Hall, Carnforth, for **Holker Maud** 23952, bay, bred by J. H. Smith, Alvaston, Derby; *s.* Pride of Blagdon 6272, *d.* Gispy 8118 *by* Harold 3703.

582 R. N. & H. C.—SIR WALTER GILBEY, BT., for **Waresley Gem.**
H. C.—JOHN BRADLEY, for No. 573, **Halstead Rose**; T. LOWNDES & SON, for No. 585, **Rolleston Fuchsia.**
Com.—VICTOR C. W. CAVENDISH, M.P., for No. 575, **Southgate Charm**; EARL EGERTON OF TATTON, for No. 579, **Tatton Bessie**; GEORGE OSENTON, for No. 588, **Edenorchid.**

Class 62.—*Shire Fillies, foaled in* 1897. [21 entries, 7 absent.]

604 I. (£15.)—SIR J. BLUNDELL MAPLE, BT., M.P., Childwickbury, St. Albans, for **Victor's Queen**, black, bred by H.R.H. The Prince of Wales; *s.* Bury Victor Chief 11105, *d.* Solace 24787 *by* Lord Arthur 9834.

606 II. (£10.)—JOHN PARNELL, Rainsbrook, Rugby, for **Rokeby Petrel**, bay; *s.* Calwich Prince 15531, *d.* Postlip Seagull 18738 *by* Bar None 2388.

603 III. (£5.)—LORD LLANGATTOCK, The Hendre, Monmouth, for **Kelvedon Marguerite**, bay, bred by Sir Henry Ewart, K.C.B., Felix Hall, Kelvedon; *s.* Curf Duncan 15070, *d.* Nyn Pink 17138 *by* Hitchin Duke 9586.

595 R. N. & H. C.—CAPT. W. H. O. DUNCOMBE, for **Waresley Joanna.**
H. C.—LORD MIDDLETON, for No. 605, **Birdsall Silver Beech**; R. N. SUTTON-NELTHORPE, for No. 607, **Chimes.**
Com.—J. P. CROSS, for No. 594, **Catthorpe Linaria**; J. C. HARRISON, for No. 601, **Pailton Model**; THE HON. F. G. WYNN, for No. 608, **Glyn Queen Regent II.**

Clydesdales.

Class 63.—*Clydesdale Stallions, foaled in* 1895. [6 entries, none absent.]

613 I. (£15.)—A. & W. MONTGOMERY, Netherhall and Banks, Kirkcudbright, N.B., for **Masher** 10232, bay, bred by A. M. McKay, Bruchag, Rothesay; *s.* Scottish Prince 9673, *d.* Snowflower 10815 *by* Chastlar 4291.

612 II. (£10.)—THE MARQUIS OF LONDONDERRY, K.G., Seaham Hall, co. Durham, for **King Dick** 10212, bay, bred by Sir James Duke, Bart., Laughton, Sussex; *s.* Black Prince of Laughton 10164, *d.* Laughton Queen 11310 *by* St. Lawrence 3220.

615 III. (£5.)—SIR JACOB WILSON, Chillingham Barns, Belford, Northumberland, for **Cœur-de-Lion**, bay, bred by Lords A. and L. Cecil, Orchardmains,

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Tonbridge; *s.* Claymore 3522, *d.* Edith Plantagenet 6010 *by* Belted Knight 1395.

611 **R. N. & H. C.**—JOHN KERR, Red Hall, Wigton, for **Crown Rights.**

Class 64.—*Clydesdale Stallions, foaled in* 1896. [3 entries, 1 absent.]

616 **I.** (**£15.**)—LORDS A. AND L. CECIL, Orchardmains, Tonbridge, for **Palmerston** 10389, black, bred by R. Brown, Roberthill, Lockerbie; *s.* Royal Standard 9847, *d.* Countess Skelmorlie 9444 *by* Skelmorlie 4027.

617 **II.** (**£10.**)—R. & R. PERCIVAL, Burgh-by-Sands, Carlisle, for **Lothian's Best** 10374, brown; *s.* Lord Lothian 5998, *d.* Flash Girl 13233 *by* Flashwood.

Class 65.—*Clydesdale Stallions, foaled in* 1897. [6 entries, 2 absent.]

622 **I.** (**£15.**)—A. & W. MONTGOMERY, Netherhall and Banks, Kircudbright, N B., for brown, bred by Robert Frederick, Drumflower, Wigtownshire; *s.* Macgregor 1487, *d.* Young Sarah Bernhardt 13075 *by* Prince of Wales 673.

624 **II.** (**£10.**)—THOMAS SMITH, Blacon Point, Chester, for brown; *s.* Baron's Pride 9122, *d.* Kate of Newfield 8198 *by* Skelmorlie 4027.

620 **R. N. & H. C.**—LORDS A. AND L. CECIL, for **Lord Burleigh.**

Class 66.—*Clydesdale Mares (with foals at foot).* [6 entries, 1 absent.]

630 **I.** (**£15.**)—THOMAS SMITH, Blacon Point, Chester, for **Belle of Fashion** 12924, brown, foaled 1891 [foal *by* Prince Pleasing 10259], bred by Sir James Duke, Bt., Laughton, Sussex; *s.* Prince of Fashion, *d.* La Belle 8325 *by* Loudoun Laird 5182.

626 **II.** (**£10.**)—LORDS A. AND L. CECIL, Orchardmains, Tonbridge, for **Fickle Fortune Princess** 13201, brown, foaled 1892 [foal *by* Macgregor 1487], bred by Robert Holloway, Alexis, Illinois, U.S.A.; *s.* Cedric 1087, *d.* Fickle Fortune *by* Knight of Lothian 4189.

628 **III.** (**£5.**)—ANDREW MITCHELL, Barcheskie, Kirkcudbright, for **Princess of Galloway** 12873, brown, foaled 1893 [foal *by* Baron's Pride 9122], bred by William McConnell, Glasnick, Wigtown; *s.* Prince of Galloway 8919, *d.* Jenny Rae 7518 *by* Good Hope 1679.

629 **R. N. & H. C.**—ROBERT REICH, Lord's Plain, Milnthorpe, for **Miss Warden.**
625 **H. C.**—LT.-GEN. THE HON. SOMERSET J. GOUGH CALTHORPE, for **Jess Park.**

Class 67.—*Clydesdale Fillies, foaled in* 1895. [7 entries, none absent.]

632 **I.** (**£15.**)—SIR JOHN GILMOUR, BT., Montrave, Leven, Fife, for **Montrave Rosamond,** bay; *s.* Prince of Albion 6178, *d.* Moss Rose 6203 *by* Prince Charlie 634.

637 **II.** (**£10.**)—HERBERT WEBSTER, Morton House, Fence Houses, for **Lady Pride,** brown, bred by Alexander Williamson, Sypland, Kirkcudbright; *s.* Baron's Pride 9122, *d.* Czarina 11160 *by* Macgregor 1487.

633 **III.** (**£5.**)—SIR JOHN GILMOUR, BT., for **Montrave Rowena,** bay; *s.* Duke of Rothesay 9191, *d.* Robina 12487 *by* Prince Robert 7135.

634 **R. N. & H. C.**—W. H. LUMSDEN, Balmedie, N.B., for **Vesta.**
636 **Com.**—HERBERT WEBSTER, for **Lady Douglas.**

Class 68.—*Clydesdale Fillies, foaled in* 1896. [6 entries, 1 absent.]

642 **I.** (**£15.**)—THOMAS SMITH, Blacon Point, Chester, for **Empress,** bay, bred by William Nicholson, Bombie, Kirkcudbright; *s.* Baron's Pride 9122, *d.* Kate of Arnbrae 12286 *by* Scottish Pearl 2949.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

643 II. (£10.)—HERBERT WEBSTER, Morton House, Fence Houses, for **Lady Victoria**, bay, bred by William Nicholson, Bombie, Kirkcudbright; *s.* Baron's Pride 9122, *d.* Kate of Bombie 13220 *by* Macgregor 1487.

639 R. N.—SIR JOHN GILMOUR, BT., for **Montrave Mermaid.**

638 Com.—LORDS A. AND L. CECIL, for **Lady Calista.**

Suffolks.

Class 69.—*Suffolk Stallions, foaled in* 1895. [5 entries, 3 absent.]

644 I. (£15.)—GEORGE COURTAULD, Cut Hedge, Halstead, Essex, for **His Grace** 2737, chestnut, bred by the late Duke of Hamilton, Easton Park, Suffolk; *s.* Eclipse 2627, *d.* Easton Belle 2497 *by* Wanderer 1463.

647 II. (£10.)—PRATT & SON, Foxboro' Hall, Melton, Woodbridge, for **Scottish Chief** 2615, chestnut, bred by the late Duke of Hamilton, Easton Park, Suffolk; *s.* Eclipse 2627, *d.* Nectar 2953 *by* Emperor 1611.

Class 70.—*Suffolk Stallions, foaled in* 1896. [4 entries, none absent.]

650 I. (£15.)—A. J. SMITH, Rendlesham, Woodbridge, for **Saturn** 2653 chestnut; *s.* Wedgewood 1749, *d.* Stella 2427 *by* Cupbearer 3rd 566.

649 II. (£10.)—PRATT & SON, Foxboro' Hall, Melton, Woodbridge, for **Lord Windsor** 2696, chestnut, bred by J. A. Hempson, Erwarton Hall, Ipswich; *s.* Windsor Chieftain 2025, *d.* Hester 1986 *by* Champion 1510.

651 R. N. & H. C.—A. J. SMITH, for **Victor.**

Class 71.—*Suffolk Stallions, foaled in* 1897. [6 entries, 1 absent.]

654 I. (£15.)—ROBERT EDGAR, Knight's Hill, Cockfield, R.S.O., for **Honesty** 2689, chestnut; *s.* Rattle 1776, *d.* Haughty *by* Macnaughten 1693.

655 II. (£10.)—SIR CUTHBERT QUILTER, BT., M.P., Bawdsey Manor, Woodbridge, for **Bawdsey Brownie** 2732, chestnut; *s.* Prince Wedgewood 2364, *d.* Sprite *by* Checkmate 1566.

656 R. N. & Com.—SIR CUTHBERT QUILTER, BT., M.P., for **Bawdsey Willie.**

Class 72.—*Suffolk Mares (with foals at foot).* [3 entries.]

661 I. (£15.)—A. J. SMITH, Rendlesham, Woodbridge, for **Stella** 2427, chestnut, foaled 1888 [foal *by* Prince Albert 2525], bred by C. Kersey's Exors., Framsden; *s.* Cupbearer 3rd 566, *d.* Brandy *by* Champion 51.

659 II. (£10.)—SIR CUTHBERT QUILTER, BT., M.P., Bawdsey Manor, Woodbridge, for **Bawdsey Dolly** 3611, chestnut, foaled 1892 [foal *by* Prince Wedgewood 2364]; *s.* Czar 1754, *d.* Sprite *by* Checkmate 1566.

660 R. N. & H. C.—E. F. QUILTER, Wantisden Hall, for **Minnie Palmer.**

Class 73.—*Suffolk Fillies, foaled in* 1895. [10 entries, 2 absent.]

664 I. (£15.)—W. BYFORD, The Court, Glemsford, Suffolk, for **Court Pride** 3880, chestnut, bred by Henry Turner, Mickfield Hall, Suffolk; *s.* Sudbourne Duke 2080, *d.* Blossom 2440 *by* Punch 898.

670 II. (£10.)—A. H. E. WOOD, Sudbourn Hall, Wickham Market, for **Hurts Duchess** 4003, chestnut, bred by William Durrant, Butley, Suffolk; *s.* Prince Arthur 2268, *d.* Dora 1697 *by* Prince Imperial 1239.

671 III. (£5.)—A. H. E. WOOD, for **Hurts Silvia** 4069, chestnut, bred by H. Showell, Playford, Ipswich; *s.* Wedgewood 1749, *d.* Silvia 1811 *by* Champion 130.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

668 **R. N. & H. C.**—A. J. SMITH, Rendlesham, Woodbridge, for **Satellite.**
666 **H. C.**—THE EARL OF DERBY, K.G., for **Jonquil.**
Com.—THE EARL OF BRADFORD, for No. 663, **Western Rose**; GEORGE COURTAULD, for No. 665, **Judy**; EARL HOWE, for No. 667, **Golden Locks.**

Class 74.—*Suffolk Fillies, foaled in* 1896. [11 entries, 2 absent.]

678 **I.** (£15.)—SIR CUTHBERT QUILTER, BT., M.P., Bawdsey Manor, Woodbridge, for **Bawdsey Pearl** 4012, chestnut; *s.* Prince Wedgewood 2364, *d.* Bawdsey Diamond 3529 *by* Chieftain 1354.

680 **II.** (£10.)—A. J. SMITH, Rendlesham, Woodbridge, for **Merry** 4038, chestnut; *s.* Wedgewood 1749, *d.* Merry Legs 1794 *by* Field Marshal 1106.

679 **III.** (£5.)—SIR CUTHBERT QUILTER, BT., M.P., for **Bawdsey Saucy Lass** 4022, chestnut; *s.* Prince Wedgewood 2364, *d.* Barmaid 3rd 2366 *by* Dreadnought 1462.

674 **R. N. & H. C.**—GEORGE COURTAULD, Cut Hedge, Halstead, for **Purity.**
Com.—W. BYFORD, for No. 673, **Court Fairy**; ROBERT EDGAR, for No. 677, **Badge**; JOHN SYMONDS, for No. 681, **Duchess.**

Draught Horses.

Class 75.—*Draught Geldings, foaled in* 1894 *or* 1895.[1] [15 entries, 7 absent.]

688 **I.** (£20.)—JAMES EADIE, Barrow Hall, Derby, for **Barrow Farmer**, bay, foaled 1894, bred by the late G. H. Spraggon, Nafferton, Stocksfield-on-Tyne; *s.* Luck 3837, *d.* Black Pride *by* Albert II. 5466.

689 **II.** (£10.)—SIR WALTER GILBEY, BT., Elsenham Hall, Essex, for chestnut, foaled 1895, bred by E. Berry, Brampton Ash, Market Harborough; *s.* Colonel V. 10617, *d.* Gipsy 16705 *by* Emperor 4371.

694 **III** (£5.)—TIMOTHY LOWE, The Oaklands, Walton, Burton-on-Trent, for **Champion**, brown, foaled 1895, breeder unknown; *s.* Muckton Champion 13346, *d. by* Sir Garnet 4037.

686 **R. N. & H. C.**—P. S DANBY, Offchurch, Leamington, for **What's Wanted.**
691 **H. C.**—ALEXANDER HENDERSON, M.P., for **Prince.**

Draught Horses of any Breed (in Harness).

Class 76.—*Pairs of Draught Mares or Geldings, above* 16 *hands* 2 *inches, belonging to one person or firm.*[1] [4 entries, 1 absent.]

701 **I.** (£15.)—JAMES YOUNG & SONS, Bryson Road, Edinburgh, for brown geldings (17·1 and 17·2 hands), foaled 1893 and 1894.

698 **II.** (£10.)—J. W. POLLITT, Mayfield, Ashton-under-Lyne, for **Waterloo** (17 hands), and **Limehurst** (16·3 hands), brown geldings, foaled 1892.

700 **III.** (£5.)—JOHN THORNICROFT, Metchley Park, Edgbaston, Birmingham, for **Spark** and **Jolly**, blue and red roan geldings (16·2 hands), foaled 1893, bred by G. Auckland, Jellott Hill, Warfield, Bracknell; *s.* Bracknell Prince.

Class 77.—*Pairs of Draught Mares or Geldings, not exceeding* 16 *hands* 2 *inches, belonging to one person or firm.*[1] [1 entry.]

702 **II.** (£10.)—ANSELL & SONS, LTD., Aston, Birmingham, for **Major**, brown gelding (16·1½ hands), and **Flirt**, bright bay mare (16 1 hands).

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[1] Prizes given by the Birmingham Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 78.—*Draught Mares or Geldings, above* 16 *hands.*[1]
[7 entries, 4 absent.]

701 I. (£10.)—JAMES EADIE, Barrow Hall, Derby, for **Bardon Extraordinary**, bay gelding (over 16 hands), foaled 1892, bred by W. T. Everard, Bardon Hall, Leicester; *s.* Extraordinary 7206, *d.* Bardon Lady Jane 13978.

703 II. (£5.)—LIEUT.-GEN. THE HON. SOMERSET GOUGH CALTHORPE, Perry Hall, Perry Barr, Birmingham, for **Kate Park**, bay mare (16·1 hands), foaled 1892, bred by W. S. Park, Hatton, Bishopton, N.B.; *s.* Prince Alexander 8899, *d.* Hatton Beauty 5687.

706 III. (£3.)—J. W. POLLITT, Mayfield, Ashton-under-Lyne, for **Gordon**, brown gelding (17 hands), foaled 1890; *s.* General Gordon.

CATTLE.

Shorthorns.

Class 79.—*Shorthorn Bulls, calved in* 1893, 1894, *or* 1895.
[19 entries, 4 absent.]

722 I. (£15, & Champion £20.[2])—PHILO L. MILLS, Ruddington Hall, Notts, for **Marengo** 69068, roan, born Feb. 6, 1895, bred by W. Duthie, Collynie, Tarves, N.B.; *s.* Scottish Archer 59893, *d.* Missie 118th *by* William of Orange 50694.

723 II. (£10.)—LORD POLWARTH, Mertoun House, St. Boswells, N.B., for **Border Riever** 68254, white, born July 19, 1894; *s.* Sir Lucius Stadley 64852, *d.* Lady Blanche *by* Bright Monarch 54041.

717 III. (£5.)—JOHN HANDLEY, Green Head, Milnthorpe, for **Prince of the North** 71236, white, born Sept. 30, 1895; *s.* Cock o' the North 57072, *d.* Princess Dacre *by* Ingram's Swell 57492.

715 R. N. & H. C.—C. M. DOYNE, Wells, Gorey, for **Father O'Flynn.**
H. C.—G. HARRISON, for No. 718, **Cornelius**; R. STRATTON, for No. 724, **Alto.**
721 Com.—W. F. INGE, for **Wild Boy.**

Class 80.—*Shorthorn Bulls, calved in* 1896. [34 entries, 2 absent.]

746 I. (£15.)—GEORGE HARRISON, Gainford Hall, Darlington, for **Misty Morning** 71021, white, born Jan. 27, bred by W. Duthie, Collynie, Tarves, N.B.; *s.* Pride of Morning 64546, *d.* Missie 137th *by* William of Orange.

760 II. (£10.)—J. DEANE WILLIS, Bapton Manor, Codford, Wilts, for **Bapton Victor** 69909, roan, born Jan. 31; *s.* Count Victor 66877, *d.* Cowslip *by* Baron Bridekirk 3rd 60302.

735 III. (£5.)—BARON F. J. DE ROTHSCHILD, M.P., Waddesdon Manor, Aylesbury, for **Spartan** 71652, roan, born Feb. 25, bred by H.M. The Queen, Prince Consort's Shaw Farm, Windsor; *s.* Count Lavender 60515, *d.* Spruce *by* Volunteer 63501.

761 R. N. & H. C.—J. DEANE WILLIS, for **Bapton Victory.**
H. C.—S. W. BENNETT, for No 732, **Prince of Roses**; SIR MARK W. COLLET, BT., for No. 736, **Arthur Roving**; JOHN HANDLEY, for No. 745, **Bapton Robin.**
Com.—HENRY DUDDING, for No. 739, **Lord Rosmead**, and No. 740, **Rosellan**; J. D. FLETCHER, for No. 742, **White Sunray**; MESSRS. LAW, for No. 749, **Lord James Douglas**; J. MIDGLEY, for No. 751, **Marvel.**

[1] Prizes given by the Birmingham Local Committee.
[2] Gold Medal given by the Shorthorn Society for the best Shorthorn Bull in Classes 79-81.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 81.—*Shorthorn Bulls, calved in* 1897. [49 entries, 8 absent.]

777 **I.** (£15, & R. N. for Champion.[1])—JOHN HANDLEY, Green Head, Milnthorpe, for **Ingram's Style**, roan, born Feb. 20, bred by Taylor & Walton, Hall Garth, Musgrave, Penrith; *s.* Dunottar 68554, *d.* May Queen 3rd (vol. xliii. p. 717) *by* Ingram's Faith 54468.

767 **II.** (£10.)—G. & H. BICKFORD, Paradise, Coven, Wolverhampton, for **Millionaire**, roan, born March 1, bred by Baron F. J. de Rothschild, M.P., Waddesdon Manor, Aylesbury; *s.* Cash 65230, *d.* Belle of Waddesdon (vol. xliii. p. 402) *by* Grand Duke 51st 57409.

763 **III.** (£5.)—H.M. THE QUEEN, The Prince Consort's Shaw Farm, Windsor, for **Councillor**, roan, born Feb. 6; *s.* Christmas Gift 66837, *d.* Charmer *by* Captain of the Guard 58596.

778 **R. N. & H. C.**—G. HARRISON, Gainford Hall, Darlington, for **Count Beauty.**

H. C.—WALTER BIRCH, for No. 768, **Prince Arvon**; HENRY DUDDING, for No. 772, **Riby Prince Charmer**; E. POTTER, for No. 795, **Nizam**; R. STRATTON, for No. 800, **Puck.**

Com.—J. W. BARNES, for No. 765, **Signalman**; GEORGE HARRISON, for No. 779, **Pretty Spicy.**

Class 82.—*Shorthorn Cows (in-milk or in-calf), calved before or in* 1894. [17 entries, 4 absent.]

813 **I.** (£15, & Champion £20.[2])—C. W. BRIERLEY, Twyford, Brimfield, for **Jewel 2nd** (vol. xliii. p. 337), red and white, born Aug. 13, 1893, in-milk, calved March 2, 1898; *s.* Rosedale George 63235, *d.* Rosedale Jewel *by* Martinet 59155.

814 **II.** (£10.)—C. W. BRIERLEY, for **Queen of Hearts** (vol. xliii. p. 337), roan, born July 21, 1893, in-milk, calved Sept. 11, 1897, and in-calf; *s.* Rosedale Referee 61650, *d.* The Queen *by* Rufus 48648.

816 **III.** (£5.)—BARON F. J. DE ROTHSCHILD, M.P., Waddesdon Manor, Aylesbury, for **Miss Belladrum 6th**, red and little white, born Nov. 18, 1893, in-milk, calved April 4, 1898, bred by Lord Lovat, Beaufort Castle, Beauly, N.B.; *s.* Lord Violet 56103, *d.* Miss Belladrum (vol. xxx. p. 595) *by* Belladrum 42777.

822 **R. N. & H. C.**—W. J. HOSKEN, Hayle, for **Countess of Oxford 14th.**

825 **H. C.**—J. A. PREECE, for **Princess Mary.**

815 **Com.**—C. W. BRIERLEY, for **Rosedale Cowslip.**

Class 83.—*Shorthorn Heifers (in-milk or in-calf), calved in* 1895. [10 entries, 1 absent.]

833 **I.** (£15.)—GEORGE HARRISON, Gainford Hall, Darlington, for **Welcome**[3] (vol. xlii. p. 440), roan, born Sept. 30, in-calf; *s.* Champion Cup 65240, *d.* Warfare *by* First Consul 57314.

831 **II.** (£10.)—LEOPOLD DE ROTHSCHILD, Ascott Home Farm, Leighton Buzzard, for **Sittyton Bride**, roan, born Jan. 10, in-milk, calved Dec. 14, 1897, bred by R. Turner, Cairnton of Boyndie, Portsoy, N.B.; *s* Sittyton Pride 67939, *d.* Flora 2nd (vol. xl. p. 637) *by* Challenge Cup 57029.

836 **III.** (£5.)—FREDERICK PLATT, Barnby Manor, Newark, for **Dewy Morn 2nd**[3] (vol. xlii. p. 581), roan, born Jan. 31, in-calf; *s.* Electric Light 65443, *d.* Dewy Morn by Flower Prince 58968.

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[1] Gold Medal given by the Shorthorn Society for the best Shorthorn Bull in Classes 79–81.

[2] Gold Medal given by the Shorthorn Society for the best Shorthorn Cow or Heifer in Classes 82–83.

[3] Subject to compliance with Regulation as to calving.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

838 **R. N. & H. C.**—J. DEANE WILLIS, for **Bapton Daisy.**
834 **H. C.**—F. MILLER, for **Sea Gem.**

Class 84.—*Shorthorn Heifers, calved in* 1896. [32 entries, 9 absent.]

846 I. (£15.)—LEOPOLD DE ROTHSCHILD, Ascott Home Farm, Leighton Buzzard, for **Mayflower 4th**, roan, born Jan. 13, bred by Robert Turner, Cairnton of Boyndie, Portsoy, N.B.; *s.* President 67611, *d.* Mayflower (vol. xxxvii. p. 525) *by* Eastern Star 58881.

854 II. (£10.)—GEORGE HARRISON, Gainford Hall, Darlington, for **Bessie Martin**, roan, born Jan. 24, bred by Sir A. H. Grant, Bt., Monymusk, N.B.; *s.* Martin 64407, *d.* Bess (vol. xlii. p. 428) *by* Patient 54784.

841 III. (£5.)—WM. BELL, Ratcheugh, Alnwick, for **Lady Clara 3rd**, roan, born March 16, bred by W. Duthie, Collynie, Tarves, N.B.; *s.* Abbotsford 66588, *d.* Cinderella (vol. xxxix. p. 343) *by* Lord Lavender 54616.

868 **R. N. & H. C.**—J. DEANE WILLIS, for **Bapton Vanity.**
H. C.—SIR MARK W. COLLET, BT., for No. 843, **Blanche St. Clere**; CAPT. D. H. MYTTON, for No. 861, **Silene**; R. A. YERBURGH, M.P., for No. 869.
857 **Com.**—W. J. HOSKEN, for **Wood Rose 2nd.**

Class 85.—*Shorthorn Heifers, calved in* 1897. [27 entries, 9 absent.]

873 I. (£15, & R. N. for Champion.[1])—JOHN W. BARNES, Aikbank, Wigton, for **Daisy 4th**, roan, born Jan. 1; *s.* Prince Victor 69324, *d.* Daisy (vol. xliii. p. 303) *by* Crown Prince 60564.

895 II. (£10.)—J. DEANE WILLIS, Bapton Manor, Codford, Wilts, for **Bapton Fluff**, roan, born Feb. 18; *s.* Count Lavender 60545, *d.* Wiltshire Daisy (vol. xli. p. 682) *by* Rising Star 54920.

871 III. (£5.)—H. M. THE QUEEN, The Prince Consort's Shaw Farm, Windsor, for **Fairy**, white, born Feb. 6; *s.* Christmas Gift 66837, *d.* Fragrant 9th (vol. xliii. p. 275) *by* Lord Violet 56103.

886 **R. N. & H. C.**—R. W. HUDSON, Danesfield, Marlow, for **Pearl.**
H. C.—LEOPOLD DE ROTHSCHILD, for No. 876, **Sittyton Pride**; GEORGE HARRISON, for No. 883, **Fairy Queen**; J. DEANE WILLIS, for No. 896, **Bapton Pearl.**

Herefords.

Class 86.—*Hereford Bulls, calved in* 1893, 1894, *or* 1895. [3 entries.]

898 I. (£15.)—J. H. ARKWRIGHT, Hampton Court, Leominster, for **Red Cross** 18040, born Feb. 14, 1894; *s.* Rose Cross 2nd 11865, *d.* Pearl 5th *by* Conjuror 5264.

900 II. (£10.)—EDGAR WIGHT, Tedstone Court, Worcester, for **Tedstone President** 18631, born Feb. 26, 1895, bred by Sir C. R. Boughton, Bt., Downton Hall, Ludlow; *s.* Royalist 3rd 16958, *d.* Cora *by* Sovereign.

899 III. (£5.)—A. E. HILL AND E. J. LEWIS, Egleton Court, Ledbury, for **Newdigate** 18498, born Jan. 25, 1895, bred by J. H. Arkwright, Hampton Court, Leominster; *s.* Pearl Cross 16852, *d.* Lively 18th *by* Hilarity 8734.

Class 87.—*Hereford Bulls, calved in* 1896. [7 entries, 3 absent.]

901 I. (£15.)—H. M. THE QUEEN, Flemish Farm, Windsor, for **Robin** 19052, born Feb. 1; *s.* Maximus 17968, *d.* Ringdove 2nd *by* Robin Hood 13383.

[1] Gold Medal given by the Shorthorn Society for the best Cow or Heifer in Classes 83–85.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

902 **II.** (£10.)—J. H. ARKWRIGHT, Hampton Court, Leominster, for **Bonny Cross** 18717, born Jan. 20; *s.* Pearl Cross 16882, *d.* Beauty 15th *by* Hilarity 8734.

905 **III.** (£5.)—W. H. DAVIES, Liver's Ocle, Hereford, for **Sir Pearce** 19099, born Feb. 8; *s.* Marquis of Arthington 16846, *d.* Marion *by* Lulham.

907 **R. N.**—DAVID EVANS, Ffrwdgrech, Brecon, for **Prince of Orange.**

Class 88.—*Hereford Bulls, calved in* 1897. [18 entries, 2 absent.]

917 **I.** (£15.)—ALLEN E. HUGHES, Wintercott, Leominster, for **Protector,** born Jan. 22; *s.* Albion 15027, *d.* Newtown Plum (vol. xxviii. p. 436) *by* Rudolph 6660.

916 **II.** (£10.)—RICHARD GREEN, The Whittern, Kington, Herefordshire, for **Malmesbury,** born Jan. 19; *s.* Overseer 16249, *d.* Merry Maid (vol. xxviii. p. 370) *by* Whittern Grove 10843.

910 **III.** (£5.)—J. H. ARKWRIGHT, Hampton Court, Leominster, for **All England,** born Jan. 22; *s.* Albion 15027, *d.* Pearl 11th (vol. xxviii. p. 167) *by* Rose Cross 2nd 14865.

918 **R. N. & H. C.**—R. KEENE, Llanvihangel Ct., Chepstow, for **Rodney Stone.**

H. C.—H.M. THE QUEEN, for No. 908, **Dictator**; J. H. ARKWRIGHT, for No. 911, **Typewriter**; THE EARL OF COVENTRY, for No. 912, **Gaudy Prince,** and No. 913, **Primate**; MAJOR EVERARD, for No. 915, **Duke of Normandy**; JOHN TUDGE, for No. 923, **Ludlow**; WM. TUDGE, for No. 925, **Tiberius.**

Com.—THE EARL OF COVENTRY, for No. 914, **Rare Boy**; RALPH PALMER, for No. 920, **Plaintiff**; WM. TUDGE. for No. 924, **Royal Rose.**

Class 89.—*Hereford Cows (in-milk or in-calf), calved before or in* 1894. [7 entries, none absent.]

926 **I.** (£10.)—H.M. THE QUEEN, Flemish Farm, Windsor, for **Truthful** (vol. xxviii. p. 152), born Jan. 9, 1890, in-milk, calved March 6, 1898; *s.* Trajan 8117, *d.* Turquoise *by* Hotspur 7028.

928 **II.** (£5.)—R. D. CLEASBY, Penoyre, Brecon, for **Miss Mary 2nd** (vol. xxvi. p. 219), born Jan. 2, 1894 [calved July 15, 1898]; *s.* Overseer 16249, *d.* Miss Mary *by* Bear 10974.

927 **R. N. & H. C.**—S. HAROLD ARMITAGE, for **Pimpernel.**

932 **H C.**—JOHN TUDGE, for **Rutheen.** 929 **Com.**—W. H. COOKE, for **Lady Downes.**

Class 90.—*Hereford Heifers (in milk or in-calf), calved in* 1895. [6 entries, 1 absent.]

935 **I.** (£10.)—RICHARD GREEN, The Whittern, Kington, Herefordshire, for **Cedar** (vol. xxvii. p. 300), born March 31, in-milk, calved Jan. 16, 1898; *s.* Pioneer 16269, *d.* Cornflower *by* Whittern Grove 10843.

933 **II.** (£5.)—THE EARL OF COVENTRY, Croome Court, Severn Stoke, Worcestershire, for **Grace** (vol. xxvii. p. 222), born Feb. 3, in-milk, calved April 13, 1898; *s.* Senator 14896, *d.* Gretchen *by* Rare Sovereign 10499.

936 **R. N. & H. C.**—JOHN TUDGE, for **Dora.**

934 **H. C.**—D. EVANS, for **Pretty Tulip 2nd.**

Class 91.—*Hereford Heifers, calved in* 1896. [4 entries, 1 absent.]

942 **I.** (£15.)—ALLEN E. HUGHES, Wintercott, Leominster, for **Wintercott Plum** (vol. xxviii. p. 436), born Jan. 29; *s.* Albion 15027, *d.* Newtown Plum *by* Rudolph 6660.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

939 II. (£10.)—J. H. ARKWRIGHT, Hampton Court, Leominster, for **Lively 27th** (vol. xxviii. p. 167), born June 10; *s.* Pearl Cross 16882, *d.* Lively 10th *by* Conjuror 15264.

941 III. (£5.)—RICHARD GREEN, The Whittern, Kington, for **Ixia** (vol. xxviii. p. 369), born Jan. 29; *s.* Gentle Boy 16071, *d.* Ivy *by* Druid 5880.

Class 92.—*Hereford Heifers, calved in* 1897. [15 entries, none absent.]

953 I. (£15.)—A. E. HUGHES, Wintercott, Leominster, for **Ladylove**, born Jan. 14; *s.* Albion 15027, *d.* Lofty 2nd (vol. xxviii. p. 435) *by* Seabreeze.

954 II. (£10.)—R. KEENE, Llanvihangel Ct., Chepstow, for **Fancibel**, born Jan. 3; *s.* Romance 17486, *d.* Fantastic (vol. xxviii. p. 458) *by* Pembridge.

956 III. (£5.)—JOHN TUDGE, Duxmoor, Craven Arms, for **Wilton Star**, born March 18; *s.* Forest King 18364, *d.* Wilton Lass (vol. xxviii. p. 698) *by* Launcelot 13917.

950 R. N. & H. C.—RICHARD GREEN, for **Raphia**.

H. C.—W. H. DAVIES, for No. 947, **Marion 2nd**, and No. 948, **Patience**; RICHARD GREEN, for No. 949, **Prunella**; JOHN TUDGE, for No. 955, **Lady Duxmoor**; WM. TUDGE, for No. 957, **Beryl**.

Com.—ADMIRAL R. F. BRITTEN, for No. 944, **Kenswick Alice**; R. D. CLEASBY, for No. 946, **Miss Molly**; HENRY HAYWOOD, for No. 951, **Purissima**.

Devons.

Class 93.—*Devon Bulls, calved in* 1893, 1894, *or* 1895. [5 entries, none absent.]

962 I. (£15.)—J. C. WILLIAMS, Caerhays Castle, St. Austell, for **Afterthought 3375**, born April 21, 1894, bred by Sir W. R. Williams, Bt., Upcott, Barnstaple; *s.* Pretty Middling 2nd 3172, *d.* Fiction 3rd 11889 *by* Captain.

958 II. (£10.)—JOHN F. R. MORRIS, Prixford House, Marwood, Barnstaple, for **Middling Character 3630**, born June 21, 1894, bred by Sir W. R. Williams, Bt., Upcott, Barnstaple; *s.* Pretty Middling 2859, *d.* Fancy 6th 11887 *by* Captain 2204.

961 III. (£5.)—ALFRED C. SKINNER, Pound Farm, Bishop's Lydeard, for **Duke of Pound 27th 3572**, born May 19, 1895; *s.* Lord Punchard 3118, *d.* Duchess 17th 8988 *by* Lord Currypool 1589.

959 R. N. & H. C.—E. MUCKLOW, for **Whitstone Commander-in-Chief**.

Class 94.—*Devon Bulls, calved in* 1896 *or* 1897. [10 entries, none absent.]

966 I. (£15.)—ALFRED C. SKINNER, Pound Farm, Bishop's Lydeard, for **Duke of Pound 29th 3725**, born Jan. 28, 1896; *s.* Masterpiece 2837, *d.* Duchess 35th 13075 *by* Lord Wolseley 2063.

971 II. (£10.)—J. C. WILLIAMS, Werrington Park, Launceston, for **Woodcock 3831**, born Jan. 27, 1896; *s.* Pretty Middling 2859, *d.* Waterhen 11885 *by* Duke of Flitton 17th 1514.

968 III. (£5.)—E. J. STANLEY, M.P., Quantock Lodge, Bridgwater, for **Quantock Jubilee 3913**, born Jan. 11, 1897; *s.* Tregothnan 2902, *d.* Beauty 9th 12118 *by* Duke of Wellington 1953.

972 R. N. & H. C.—SIR W. R. WILLIAMS, BT., for **Robert George**.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 95.—*Devon Cows (in-milk or in-calf), calved before or in* 1894. [5 entries, none absent.]

975 I. (£15.)—ALFRED C. SKINNER, Pound Farm, Bishop's Lydeard, for **Moss Rose 22nd of Pound** 13608, born Feb. 21, 1893 [calved Sept. 13, 1898]; *s.* Masterpiece 2837, *d.* Moss Rose 16th 11737 *by* Baron Golsoncott 4th 2193.

974 II. (£10.)—THE HON. E. W. B. PORTMAN, Hestercombe, Taunton, for **Handsome 3rd** 14665, born Jan. 1, 1894, in-milk, calved June 9, 1898, bred by John Blackmore, Buckland, Durston, Taunton; *s.* Nobleman 2848, *d.* Handsome 2nd 7497 *by* Actor.

973 III. (£5.)—ALFRED BOWERMAN, Capton, Williton, Taunton, for **Majestic** 13767, born Dec. 31, 1894, in-milk, calved Sept. 7, 1897; *s.* Starlight 3514, *d.* Snow 13786 *by* Admiral Wood 1880.

976 R. N. & H. C.—ALFRED C. SKINNER, for **Myrtle 38th.**

Class 96.—*Devon Heifers (in-milk or in-calf), calved in* 1895. [4 entries.]

978 I. (£15.)—ALFRED BOWERMAN, Capton, Williton, Taunton, for **Sally**, born Jan. 10, in-milk, calved Sept. 13, 1897; *s.* Starlight 3514, *d.* Dolly 5th 9482 *by* Lord Ilbear 1779.

981 II. (£10.)—WILLIAM TRICK, Flitton Barton, North Molton, for **Duchess of Flitton 2nd**[1] 14843, born Nov. 25, in-calf; *s.* Fisherman 2977, *d.* Curly 8th 12584 *by* Briton 2349.

979 III. (£5.)—ALFRED C. SKINNER, Pound Farm, Bishop's Lydeard, for **Fancy 21st of Pound**[1] 14774, born June 12, in-calf; *s.* Compensator 2942, *d.* Fancy 17th 12430 *by* General Gordon 1974.

980 R. N. & H. C.—E. J. STANLEY, M.P., for **Quantock Cowslip 10th.**

Class 97.—*Devon Heifers, calved in* 1896. [8 entries, 1 absent.]

983 I. (£10.)—ALFRED BOWERMAN, Capton, Williton, Taunton, for **Mustard** 14976, born March 13; *s.* Lord Culverhay 3469, *d.* Apricot 13743 *by* Palmerston 2474.

989 II. (£5.)—SIR W. R. WILLIAMS, BT., Upcott, Pilton, Barnstaple, for **Fiction 6th** 15518, born Jan 1.; *s.* Pretty Middling 2nd 3172, *d.* Fiction 4th 12580 *by* Captain 2204.

988 R. N. & H. C.—E. J. STANLEY, M.P., for **Quantock Moss Rose 23rd.**
H. C.—H. M. THE QUEEN, for No. 982, **Princess**; ALFRED BOWERMAN, for No. 984, **Nutmeg**; THE HON. E. W. B. PORTMAN, for No. 985 **Gentlemaid**; A. C. SKINNER, for No. 987, **Myrtle 56th of Pound.**

Class 98.—*Devon Heifers, calved in* 1897. [6 entries, 1 absent.]

995 I. (£10.)—J. C. WILLIAMS, Werrington Park, Launceston, born March 8; *s.* Pretty Middling 2859, *d.* Diamond Necklet 3rd 12560 *by* Duke of Flitton 17th 1544.

994 II. (£5.)—J. C. WILLIAMS, Caerhays Castle, St. Austell, born Jan. 9; *s.* Afterthought 3375, *d.* Nessie 2nd 14292 *by* Cardsharper 3082.

990 R. N. & H. C.—ALFRED BOWERMAN, Capton, Williton, Som., for **Poteen.**
Com.—THE HON. E. W. B. PORTMAN, for No. 992, **Lowton**; ALFRED C. SKINNER, for No. 993, **Myrtle 58th of Pound.**

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[1] Subject to compliance with Regulation as to calving.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Sussex.

Class 99.—*Sussex Bulls, calved in* 1893, 1894, *or* 1895. [3 entries, 1 absent.]

997 I. (£15.)—The Hon. Ralph P. Nevill, Birling, West Malling, for **Gladsome Prince** 1370, born Feb. 3, 1894, bred by the Earl of Derby; *s.* Proud Prince 1249, *d.* Gladsome 3rd 4008 *by* Oxford 2nd 771.

996 II. (£10.)—The Earl of Derby, K.G., Birtley, Witley, Godalming, for **Gamecock** 1414, born Jan. 3, 1895; *s.* Lord Oxeye of Wantly 1070, *d.* Gladsome 3rd 4008 *by* Oxford 2nd 771.

Class 100.—*Sussex Bulls, calved in* 1896 *or* 1897. [7 entries, 1 absent.]

999 I. (£15.)—The Earl of Derby, K.G., Birtley, Witley, Godalming, for **Merchant** 1485, born June 6, 1896; *s.* Golden Rex 1303, *d.* Merry May 5854 *by* Billy Boy Blue 1081.

1005 II. (£10.)—George White, Hunton, Maidstone, for **Ensign**, born March 2, 1897; *s.* Lieutenant 1362, *d.* Kitty 5699 *by* Ruby 2nd 721.

1002 III. (£5.)—Philip Saillard, Buchan Hill, Crawley, for **Bewbush Lad**, born June 5, 1897; *s.* Lord Oxeye 2nd 1383, *d.* Cherry Tart 5662 *by* Saracen 1032.

1000 R. N.—H. Partridge, for **Bletchingley 1st.**

Class 101.—*Sussex Cows or Heifers (in-milk or in-calf), calved before or in* 1895. [3 entries, 1 absent.]

1008 I. (£15.)—Philip Saillard, Buchan Hill, Crawley, for **Elsa 2nd** 5732, born Jan. 20, 1892, in-milk, calved Feb. 15, 1898, bred by W. B. Waterlow, High Trees, Redhill; *s.* Knight of Woodmancote 3rd 965, *d.* Elsa 3214 *by* Wallace 478.

1007 II. (£10.)—The Earl of Derby, K.G., Birtley, Witley, Godalming, for **Carnation** 6495, born May 9, 1894 [calved July 11, 1898]; *s.* Gladiator 1171, *d.* Cuckoo 5462 *by* Frank 997.

Class 102.—*Sussex Heifers, calved in* 1896. [8 entries, 2 absent.]

1015 I. (£10.)—Gerald Warde, Tutsham Hall, West Farleigh, Maidstone, for **Tutsham Twin 2nd** 7203, born June 4; *s.* Rochester 1114, *d.* Twin D 3 6069 *by* Otham 769.

1016 II. (£5.)—Earl Winterton, Shillinglee Park, Petworth, for **Shillinglee Lollipop** 7236, born April 8; *s.* Shylock 1343, *d.* Sugarcane 5707 *by* Gold 815.

1014 R. N. & H. C.—F. Warde, for **Aldon Wilderness 1st.**

1012 H. C.—H. Partridge, for **Gretchen.** 1013 Com.—Philip Saillard, for **Bewbush May.**

Class 103.—*Sussex Heifers, calved in* 1897. [7 entries.]

1020 I. (£10.)—F. Warde, Aldon, Addington, Kent, for **Aldon Jewel**, born Jan. 4; *s.* Aldon 1st 1450, *d.* Prebble A 5 6055 *by* Stella's Oxford 651.

1017 II. (£5.)—The Earl of Derby, K.G., Birtley, Witley, Godalming, for **Bangle** 7343, born Feb. 4; *s.* Golden Rex 1303, *d.* Broad Bess 5302 *by* Court Wick 801.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1018 **R. N. & H. C.**—H. PARTRIDGE, for **Sunflower.**

H. C.—PHILIP SAILLARD, for No. 1019, **Muriel**; EARL WINTERTON, for No. 1022, **Sempstress 6th.**

Com.—FREDERICK WARDE, for No. 1021, **Aldon Pride**; EARL WINTERTON, for No. 1023, **Speculation 4th.**

Longhorns.

Class 104.—*Longhorn Bulls of any age.*[1] [6 entries.]

1027 **I.** (£7.)—H. JASPER SELWYN, Little Woodcote, Kenilworth, for **Kenilworth**, brindle, born March 30, 1895, bred by T. Taverner, Upton, Nuneaton; *s.* Earl of Upton 10th, *d.* Plum *by* Peach.

1025 **II.** (£3.)—THE HON. E. A. FITZ ROY, Fox Hill, West Haddon, Rugby, for **Charles 2nd**, red and white, born March 28, 1895, bred by the late T. Satchwell, Hearnfield, Knowle; *s.* Windsor, *d.* Emily *by* Rocket.

1026 **III.** (£2.)—BARONESS KINLOSS, Biddlesden Park, Brackley, for **Albert Edward**, brindle, born June 10, 1893; *s.* Prince Albert, *d.* Waterloo 9th *by* Conqueror 3rd.

1028 **R. N. & H. C.**—H. JASPER SELWYN, for **Pretender 2nd**, & **H. C.** for No. 1029, **Wooton Wonder.**

1024 **Com.**—MRS. R. D. DERING, for **Young Clinton.**

Class 105.—*Longhorn Cows or Heifers (in-milk or in-calf), calved before or in* 1895.[1] [10 entries, 1 absent.]

1034 **I.** (£7.)—W. HANSON SALE, Mancetter Cottage, Atherstone, for **Moss Rose**, red and white, born March 11, 1891, in-milk, calved Feb. 20, 1898; *s.* Rugby, *d.* Daisy *by* Peter.

1035 **II.** (£3.)—W. HANSON SALE, for **Shaw's Fradley Beauty**, brindle red and white, born Jan. 5, 1893, in-milk, calved March 20, 1898, bred by W. S. Shaw, Fradley, Lichfield; *s.* The Duke, *d.* Flora *by* The Major.

1031 **III.** (£2.)—THE HON E. A. FITZ ROY, Fox Hill, West Haddon, Rugby, for **Carolina**, red and white, born Dec. 18, 1891 [calved July 25, 1898], bred by Baroness Kinloss, Biddlesden Park, Brackley; *s.* The Baron, *d.* Caroline *by* Conqueror 6th.

1039 **R. N. & H. C.**—WM. SHAW, JUN., Fradley, Lichfield, for **Duchess.**

1032 **H. C.**—BARONESS KINLOSS, for **Lavender.**

Com.—BARONESS KINLOSS, for No. 1033, **Waterloo 9th**; H. JASPER SELWYN, for No. 1036, **Melcombe Duchess.**

Class 106.—*Longhorn Heifers, calved in* 1896 *or* 1897.[1] [6 entries, none absent.]

1040 **I.** (£7.)—THE HON. E. A. FITZ ROY, Fox Hill, West Haddon, Rugby, for **Angelica**, red and white, born Dec. 12, 1896; *s.* Restless William, *d.* Venus *by* Kenilworth.

1044 **II.** (£3.)—H. JASPER SELWYN, Little Woodcote, Kenilworth, for **Warwickshire Lass**, mottled, born March 29, 1897; *s.* Pretender 2nd, *d.* Patty *by* Peter.

1045 **III.** (£2.)—H. JASPER SELWYN, for **Woodcote Empress**, brindle and white, born Mar. 26, 1897; *s* Pretender 2nd, *d.* Dolly *by* Prince Arden.

1041 **R. N. & H. C.**—THE HON. E. A. FITZROY, for **Bridget.**

[1] Prizes given by the Birmingham Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Welsh.

Class 107.—*Welsh Bulls, calved in* 1893, 1894, *or* 1895. [4 entries.]

1049 I. (£15.)—COLONEL H. PLATT, Gorddinog, Llanfairfechan, for **Madoc Lad** 311, born Jan. 4, 1894, bred by R. M. Greaves, Wern, Portmadoc; *s.* St. Beuno 316, *d.* Madoc Maid 889 *by* Tywysog Du 177.

1046 II. (£10.)—R. M. GREAVES, Wern, Portmadoc, for **Bryntwr**, born Jan. 10, 1895; *s.* Ulundi 238, *d.* Gwernen Ddu 888 *by* Sir Watkin 2nd 126.

1047 R. N. & H. C.—LORD HARLECH, for **Merioneth.**

1048 Com.—W. E. OAKELEY, for **Hwfa**

Class 108.—*Welsh Bulls, calved in* 1896 *or* 1897. [3 entries.]

1050 I. (£15.)—R. M. GREAVES, Wern, Portmadoc, for **Madoc Boy**, born June 24, 1897; *s.* Madoc Lad 311, *d.* Royal Windsor 2nd *by* William Pennant.

1052 II. (£10.)—W. E. OAKELEY, The Plâs, Tan-y-Bwlch, for **Cawr**, born Mar. 17, 1896; *s.* Morfa Bychan 312, *d.* Mair 4th 969 *by* Latimer 188.

1051 R. N.—LORD HARLECH, for **Goliath.**

Class 109.—*Welsh Cows or Heifers (in-milk or in-calf), calved before or in* 1895. [5 entries, 1 absent.]

1057 I. (£15.)—COL. H. PLATT, Gorddinog, Llanfairfechan, for **Queen of Spades 2nd**[1] 1034, born Feb. 19, 1895, in-calf; *s.* The Alderman 358, *d.* Queen of Spades 1033.

1055 II. (£10.)—W. E. OAKELEY, The Plâs, Tan-y-Bwlch, for **Mair 4th**[1] 969, born Jan. 3, 1892, in-calf; *s.* Latimer 188, *d.* Mair 3rd 740 *by* Harlech 96.

1056 R. N. & H. C.—COL. H. PLATT, for **Kate 2nd.**

1053 H. C.—R. M. GREAVES, for **Cefn Ddu.**

Class 110.—*Welsh Heifers, calved in* 1896. [4 entries.]

1059 I. (£10.)—W. E. OAKELEY, The Plâs, Tan-y-Bwlch, for **Tecwynisa**, born Jan. 2; *s.* Llandecwyn 343, *d.* Dinah Oakeley 962 *by* Rhaiadr Du.

1058 II. (£5.)—R. M. GREAVES, Wern, Portmadoc, for **Minx**, born Jan. 4; *s.* Bounce 308, *d.* Bloden Ddu 884 *by* Tywysog Du 177.

1060 R. N. & H. C.—COL. H. PLATT, for **Gwladys**, and Com. for No. 1061, **Rustic Queen 2nd.**

Class 111.—*Welsh Heifers, calved in* 1897. [5 entries.]

1062 I. (£10.)—R. M. GREAVES, Wern, Portmadoc, for **Tremadoc**, born Jan. 3; *s.* Madoc Lad 311, *d.* Treflys.

1066 II. (£5.)—COL. H. PLATT, Gorddinog, Llanfairfechan, for **Cambrian Princess 3rd**, born Jan. 13; *s.* City Councillor 347, *d.* Cambrian Princess.

1065 R. N. & H. C.—COL. PLATT, for **Black Empress 2nd.**

1064 H. C.—LORD HARLECH. 1063 Com.—R. M. GREAVES, for **Winter Queen.**

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[1] Subject to compliance with Regulation as to calving.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Red Polled.

Class 112.—*Red Polled Bulls, calved in* 1893, 1894, *or* 1895. [6 entries, none absent.]

1068 I. (£15, & **Champion.**[1])—THOMAS BROWN & SON, Marham Hall, Downham Market, for **Uncas** 3754, born March 5, 1893; *s.* Didlington Davyson 2nd 657, *d.* Poppinette 2455 *by* Davyson 3rd 48.

1071 II. (£10, & R. N. for **Champion**[1])—JAMES E PLATT, Bruntwood, Cheadle, for **Caistor Mincemeat** 4269, born July 8, 1895, bred by H. P. Green, Caistor Hall, Norwich; *s.* Duke of Gloster 3472, *d.* Minnie 8015 *by* Earl 2279.

1070 III. (£5.)—LORD HASTINGS, Melton Constable, for **Matabele** 4522, born Jan. 4, 1895; *s.* Broadbent 1721, *d.* Hopeful 7187 *by* Cove 1490.

1072 R. N.—A. J. SMITH, for **Comely Roger.**

Class 113.—*Red Polled Bulls, calved in* 1896 *or* 1897. [7 entries, none absent.]

1077 I. (£15.)—JAMES E. PLATT, Bruntwood, Cheadle, for **Able Risky** 4722, born Feb. 21, 1896, bred by George Gooderham, Monewden, Wickham Market; *s.* Able Use 3360, *d.* Sunny Risky 6010 *by* Sunflower 1309.

1076 II. (£10.)—R. HARVEY MASON, Necton Hall, Swaffham, for **Magician** 5021, born June 3, 1896; *s.* Majiolini 3600, *d.* Mempris 9562 *by* Paris 1974.

1078 III. (£5.)—JAMES E. PLATT, for **Caistor Minotaur** 4786, born June 3, 1896, bred by H. P. Green, Caistor Hall, Norwich; *s.* Matabele 3608, *d.* Minnie 8045 *by* Earl 2279.

1079 R. N. & H. C.—A. J. SMITH, Rendlesham, Woodbridge, for **Meltonian.**

1074 H. C.—J. J. COLMAN, for **Redmond.** 1075 Com.—HIS HONOUR JUDGE KELLY, for **Chieftain.**

Class 114.—*Red Polled Cows or Heifers (in-milk or in-calf), calved before or in* 1895. [6 entries, none absent.]

1081 I. (£15, & **Champion.**[2])—J. J. COLMAN, Carrow House, Norwich, for **Red Top** 8911, born July 30, 1893, in-milk, calved Jan. 23, 1898; *s.* Red Prince 2902, *d.* Topsy 5168 *by* Iago 1025.

1082 II. (£10, & R. N. for **Champion.**[2])—JAMES E. PLATT, Bruntwood, Cheadle, for **Brinhilda** 8377, born Feb. 12, 1893, in-milk, calved April 27, 1898, bred by J. J. Colman, Carrow House, Norwich; *s.* Jupiter 2380, *d.* Brindy 3896 *by* Falstaff 303.

1084 III. (£5.)—JAMES E. PLATT, for **Dorylass** 10191, born March 3, 1895, in-milk, calved May 26, 1898, bred by J. J. Colman, Carrow House, Norwich; *s.* Red Prince 2902, *d* Dorena 6308 *by* Iago 1025.

1080 R. N.—J. J. COLMAN, Carrow House, Norwich, for **Red Dolly.**

Class 115.—*Red Polled Heifers, calved in* 1896. [4 entries, none absent.]

1087 I. (£10.)—J. J. COLMAN, Carrow House, Norwich, for **Necklace** 11610, born June 20; *s.* Red Prince 2902, *d.* Jewel 2nd 9448 *by* Negro 1956.

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[1] Prize, value £10, given by the Red Polled Society for the best Red Polled Bull in Classes 112 & 113.

[2] Prize, value £10, given by the Red Polled Society for the best Red Polled Cow or Heifer in Classes 114-116.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1086 **II.** (*£5.*)—J. J. Colman, for **Armlet** 10946, born May 17; *s.* Red Prince 2902, *d.* Brace 4475 *by* Falstaff 308.

1088 **R. N.**—James E. Platt, Bruntwood, Cheadle, for **Red Princess.**

Class 116.—*Red Polled Heifers, calved in* 1897. [4 entries, 1 absent.]

1090 **I.** (*£10.*)—J. J. Colman, Carrow House, Norwich, for **Delia** 12190, born Jan. 19; *s.* Ruby Prince 4131, *d.* Delphine 9260 *by* Jupiter 2380.

1091 **II.** (*£5.*)—J. J. Colman, for **Lady Ruby** 12529, born Jan. 23; *s.* Ruby Prince 4131, *d.* Red Top 8911 *by* Red Prince 2902.

Aberdeen Angus.

Class 117.—*Aberdeen Angus Bulls, calved in* 1893, 1894, *or* 1895. [10 entries, 2 absent.]

1102 **I.** (*£15, & Champion.*[1])—The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, for **Edenhall** 12442, born Feb. 3, 1895, bred by Sir G. Macpherson Grant, Bt., Ballindalloch Castle, Banffshire; *s.* Eltham 9120, *d.* Edelite 15041 *by* Iliad 2843.

1097 **II.** (*£10.*)—J. Douglas Fletcher, Rosehaugh, Avoch, Ross-shire, for **Baron Ambrose** 12265, born Jan. 29, 1895; *s.* Minotaur of Rosehaugh 9421, *d.* Ambrosia 7888 *by* Heir of Glory 1746.

1096 **III.** (*£5.*)—The Rev. Charles Bolden, Preston Bissett, Buckingham, for **Proud Duke of Ballindalloch** 12031, born May 8, 1894, bred by Sir G. Macpherson Grant, Bart., Ballindalloch Castle, N.B.; *s.* Prince Inca 7844, *d.* Pride of Dalmore 4th 13914 *by* The Black Knight 1809.

1099 **R. N. & H. C.**—R. D'Arcy Jameson, for **Captain Lucius 2nd.**

H. C.—The Rev. C. Bolden, for No. 1095, **Prophet**; George Laing, for No. 1100, **Eberhard of Cortachy.**

Com.—George Hoyles, for No. 1098, **Doughty**; Col. W. N. Tufnell, for No. 1103, **Doodle.**

Class 118.—*Aberdeen Angus Bulls, calved in* 1896 *or* 1897. [9 entries, 1 absent.]

1108 **I.** (*£15.*)—Alexander McLaren, Auchnaguie, Tullymet, Ballinluig, N.B., for **Delamere** 13305, born Jan. 15, 1896, bred by Patrick Chalmers, Aldbar, Brechin, N.B.; *s.* Enthusiast of Ballindalloch 8289, *d.* Pride of Burnshangie 21017 *by* Pilchard 7827.

1112 **II.** (*£10.*)—Clement Stephenson, Sandyford Villa, Newcastle-on-Tyne, for **Best Man of Benton** 13173, born Jan. 17, 1896; *s.* Albion 6525, *d.* Bride 13343 *by* Sir Peter 5020.

1106 **III.** (*£5.*)—The Marquis of Huntly, Aboyne Castle, Aberdeenshire, for **Jipsey Baron** 13532, born Jan. 23, 1896, bred by William Whyte, Spott, Kirriemuir, N.B.; *s.* Junior Rover 11796, *d.* Juddy 2nd 7960 *by* Dreadnought 1814.

1104 **R. N. & H. C.**—The Rev. C. Bolden, for **Rhombus of Glamis.**

1110 **H. C.**—G. E. Meakin, for **King of Cresswell.**

Class 119.—*Aberdeen Angus Cows or Heifers (in-milk or in-calf), calved before or in* 1895. [9 entries, 1 absent.]

1121 **I.** (*£15.*)—Charles W. Schroeter, Tedfold, Billingshurst, for **Pride of Kirkurd** 20522, born Jan. 17, 1893, in-milk, calved Dec. 20, 1897, bred

[1] Gold Medal given by the Polled Cattle Society for the best Aberdeen Angus Animal in Classes 117–121.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

by Sir T. D. G. Carmichael, Bt., Skirting Castlecraig; *s.* Privateer of Cortachy 9550, *d.* Pride of Coull 13836 *by* Frederick the Great 4680.

1113 II. (£10.)—FRED CRISP, White House, New Southgate, for **Sabrina of Gorthlick** 20353, born March 20, 1893, in-milk, calved Jan. 16, 1898, bred by J. C. Cunningham, Foyers, Gorthlick, N.B.; *s.* Ajax of Guisachan 2438, *d.* Sulina 8223 *by* Lambro 2911.

1120 III. (£5.)—THE EARL OF ROSEBERY, K.G., Dalmeny Park, Edinburgh, for **Pridella of Dalmeny 2nd**[1] 22222, born March 13, 1894, in-calf; *s.* Marquis of Moray 9387, *d.* Pridella of Dalmeny 19738 *by* Blossom 8135.

1114 R. N. & H. C.—FRED CRISP, New Southgate, for **Shepherdess.**
H. C.—T. B. & J. W. EARLE, for No. 1115, **Moonshine of Advie**; R. W. HUDSON, for No. 1116, **Exactly Right**; G. E. MEAKIN, for No. 1119, **Pride of Enzie 4th.**

1117 Com.—R. W. HUDSON, for **Joyful of Ballindalloch.**

Class 120.—*Aberdeen Angus Heifers, calved in* 1896. [12 entries, 1 absent.]

1132 I. (£10, & R. N. for Champion.[2])—THE EARL OF STRATHMORE AND KINGHORNE, Glamis Castle, N.B., for **May of Glamis** 24827, born Feb. 23; *s.* Siberian 5720, *d.* May 23rd 21079 *by* Norfolk 5th 7022.

1131 II. (£5.)—THE EARL OF STRATHMORE AND KINGHORNE, for **Estille** 24824, born Jan. 9; *s.* Siberian 5720, *d.* Evangeline of Glamis 13136 *by* Alister 1939.

1124 R. N. & H. C.—FRED CRISP, New Southgate, for **Lady May of Advie.**
H. C.—R. W. HUDSON, for No. 1125, **Rhona of Ballindalloch**; C. E. HUNTER, for No. 1126, **Eye Witness**; COL. W. F. TUFNELL, for No. 1133, **Vecchia.**
Com.—GEORGE OSENTON, for No. 1128, **Meadow-sweet of Mariners**; THE SEATON DELAVAL COAL CO., for No. 1129, **Pride 2nd of Delaval.**

Class 121.—*Aberdeen Angus Heifers, calved in* 1897. [16 entries, 4 absent.]

1144 I. (£10.)—THE EARL OF ROSEBERY, K.G., Dalmeny Park, Edinburgh, for **Pridella of Dalmeny 4th** 25987, born Feb. 3; *s.* Edenhall 12442, *d.* Pridella of Dalmeny 2nd 22222 *by* Marquis of Moray 9387.

1143 II. (£5.)—SIR J. BLUNDELL MAPLE, BT., M.P., Childwickbury, St. Albans, for **Pride of Southgate** 25228, born Jan. 15, bred by Fred Crisp, White House, New Southgate, Middlesex; *s.* Gilderoy 9208, *d.* Pride of Pitcraigie 19110 *by* Bloodstone 8133.

1148 R. N. & H. C.—THE EARL OF STRATHMORE AND KINGHORNE, for **Baroness of Glamis.**
H. C.—CLEMENT STEPHENSON, for No. 1147, **Jipsey of Benton 3rd**; THE EARL OF STRATHMORE AND KINGHORNE, for No. 1149, **Venelia.**
Com.—T. B. & J. W. EARLE, for No. 1138, **Pride of Kirkbridge**; C. E. HUNTER, for No. 1140, **Heatherbed of Selaby**; MAJOR F. LAMBART, for No. 1141, **Colleen Bawn**, and No. 1142, **Isa of Crocknacrieve**; C. W. SCHROETER, for No. 1146, **Tedfold Favourite 9th.**

Galloways.

Class 122.—*Galloway Bulls, calved in* 1893, 1894, *or* 1895. [1 entry.]

1150 I. (£15.)—JOHN CUNNINGHAM, Durham Hill, Dalbeattie, N.B., for **Scottish Standard** 6488, born April 5, 1895, bred by C. Graham, Harelaw

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[1] Subject to compliance with Regulation as to calving.
[2] Gold Medal given by the Polled Cattle Society for the best Aberdeen Angus animal in Classes 117–121.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Hill, Canonbie, N.B.; *s.* The Pathfinder 3rd 5991, *d* Gentle Rose 2nd 13029 *by* Camp Follower 5012.

Class 123.—*Galloway Bulls, calved in* 1896 *or* 1897. [5 entries, none absent.]

1153 I. (£15.)—CHRISTOPHER GRAHAM, Skipmyre, Lochmaben, N.B., for **Minotaur** 6620, born April 11, 1896, bred by W. Parkin-Moore, Whitehall, Mealsgate, Cumberland; *s.* Macdougall 3rd of Tarbreoch 5840, *d.* Lady Mina of Castlemilk 12937 *by* Talisman 2nd of Castlemilk 4415.

1155 II. (£10.)—ROBERT JEFFERSON, Rothersyke, Egremont, Cumberland, for **Jubilee Gift** 6856, born Jan. 2, 1897, bred by C. Graham, Harelaw Hill, Canonbie, N.B.; *s.* The Pathfinder 3rd 5991, *d.* Harelaw Hill Lizzie 13031 *by* Camp Follower 5012.

1154 III. (£5.)—HENRY GRAHAM, Quarry Hill, Mealsgate, for **Blackamore** 6622, born April 20, 1896, bred by W. Parkin-Moore, Whitehall, Mealsgate, ; *s.* Nonpareil of Castlemilk 6163, *d.* Nancy Lee 2nd 11992 *by* Scottish Borderer 669.

1151 Com.—THE DUKE OF BUCCLEUCH AND QUEENSBERRY, K.G., for **Barrosa.**

Class 124.—*Galloway Cows or Heifers (in-milk or in-calf), calved before or in* 1895. [5 entries, 1 absent.]

1158 I. (£15.)—JOHN CUNNINGHAM, Durham Hill, Dalbeattie, N.B., for **Dora of Durham Hill** 13550, born March 4, 1893, in-milk, calved Jan. 7, 1898, bred by James Cunningham, Tarbreoch, Dalbeattie; *s.* Camp Follower 5042, *d.* Dora 4th of Tarbreoch 11996 *by* Harden 1151.

1159 II. (£10.)—JOHN CUNNINGHAM, for **Maggie Lauder of Durham Hill**[1] 13994, born Feb. 3, 1894, in-calf, bred by H. G. Murray Stewart, Cally, Gatehouse, N.B ; *s.* Pathfinder 2nd 5838, *d.* Hope 3rd of Cally 12759 *by* Sir Frederick Graham 3rd 4856.

1160 III. (£5.)—LEONARD PILKINGTON, Cavens, Dumfries, for **Mabel of Castlemilk** 12950, born Jan. 17, 1892, in-milk, calved May 29, 1897, and in-calf, bred by Sir Robert Jardine, Bt, Castlemilk, Lockerbie; *s.* Black Douglas of Castlemilk 5002, *d.* Maggie 4th of Garliestown 10053 *by* Ivanhoe 3060.

1157 Com.—THE COUNTESS OF CARLISLE, for **Snowdrop of Naworth.**

Class 125.—*Galloway Heifers, calved in* 1896. [4 entries.]

1162 I. (£10.)—JOHN CUNNINGHAM, Durham Hill, Dalbeattie, N.B., for **Louisa 2nd of Durham Hill** 14925, born April 4; *s.* Camp Follower 5012, *d.* Dora 4th of Tarbreoch 11996 *by* Harden 1151.

1161 II. (£5.)—THE DUKE OF BUCCLEUCH AND QUEENSBERRY, K.G., Drumlanrig Castle, Thornhill, N.B., for **Amelia 2nd of Drumlanrig** 14660, born Jan. 22 ; *s.* Bosphorus 4693, *d.* Amelia of Drumlanrig 13412 *by* Royal Liberty 4140.

1164 R. N. & H. C.—W. PARKIN-MOORE, for **Minette 2nd of Whitehall.**
1163 Com.—ANDREW MONTGOMERY, for **Nellie 7th of Lochenkit.**

Class 126.—*Galloway Heifers, calved in* 1897. [9 entries, 1 absent.]

1170 I. (£10.)—ANDREW MONTGOMERY, Nether Hall, Castle Douglas, N.B., for **Favourite 6th of Lochenkit** 15084, born Feb. 14, bred by John McCormick, Lochenkit, Corsock, N.B.; *s.* Contender 4th of Tarbreoch 5994, *d.* Favourite 4th of Lochenkit *by* Scottish Hero of Tarbreoch 5300.

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[1] Subject to compliance with Regulation as to calving.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1172 **II.** (£5.)—W. PARKIN-MOORE, Whitehall, Mealsgate, for **Pearl of Whitehall 15031**, born Jan. 15; *s.* Macdougall 3rd of Tarbreoch 5810, *d.* Scotch Pearl 6th 12483 *by* Royal Jubilee Liberty 4421.

1167 **R. N. & H. C.**—THE COUNTESS OF CARLISLE, for **Vaudeville 7th of Naworth.**

1165 **Com.**—THE DUKE OF BUCCLEUCH AND QUEENSBERRY, K.G., for **Fairy Queen 5th of Drumlanrig.**

Ayrshires.

Class 127.—*Ayrshire Bulls, calved in* 1893, 1894, *or* 1895. [2 entries, 1 absent.]

1174 **I.** (£15.)—ROBERT MCKINLAY, Hillhouse, Sandilands, N.B., for **Douglas Chief of Hillhouse 3400**, white and brown, born May 25, 1894, bred by James Howie, Hillhouse, Kilmarnock; *s.* Cock-a-Bendie of Drumjoan 1204, *d.* Daisy of Burnhouses *by* Torcross 3rd of Orchardton 637.

Class 128.—*Ayrshire Bulls, calved in* 1896 *or* 1897. [5 entries.]

1179 **I.** (£15.)—ROBERT OSBORNE, Wynholm, Lockerbie, N.B., for **Gigantic Stunner**, white and brown spots, born Feb. 15, 1896; *s.* Famous Design of Wynholm 3118, *d.* Georgina of Wynholm (vol. xviii. p. 245) *by* Fifty of Holehouse 1928.

1180 **II.** (£10.)—SIR MARK J. MCTAGGART STEWART, BT., M.P., Southwick, Dumfries, for **Zerooma**, dark brown and white, born Feb. 21, 1897, bred by Mr. Barr, Monkland, Kilmarnock; *s.* White Cockade of Nether Craig 2852, *d.* Cherry 2nd.

1176 **III.** (£5.)—ANDREW MITCHELL, Barcheskie, Kirkcudbright, for **Lord Inverdee**, white and brown, born March 4, 1897; *s.* Oliver Twist of Barcheskie 3455, *d.* Snowdrift of Barcheskie *by* Adjutant of South Cumberhead 1819.

1177 **R. N. & H. C.**—ANDREW MITCHELL, for **The Baron.**

1178 **Com.**—ROBERT OSBORNE, for **Emblem of Elegance.**

Class 129.—*Ayrshire Cows or Heifers (in-milk or in-calf), calved before or in* 1895. [5 entries, 3 absent.]

1183 **I.** (£15.)—ANDREW MITCHELL, Barcheskie, Kirkcudbright, for **Mary**, brown and white, born May 28, 1894 [calved June 29, 1898], bred by W. Lambie, Sunnyside, Ayr; *s.* Prince of Sunnyside (vol. xxii.), *d.* Ann of Sunnyside *by* Geordie.

1184 **R. N. & H. C.**—ANDREW MITCHELL, for **Winnie 2nd of Barcheskie.**

Class 130.—*Ayrshire Heifers, calved in* 1896. [3 entries.]

1186 **I.** (£10.)—ANDREW MITCHELL, Barcheskie, Kirkcudbright, for **Bright Lady**, white and brown, born March 2, bred by Hugh Todd, Harperland, Dundonald, Ayrshire; *s.* Traveller's Heir of Holehouse 2903, *d.* Mary of Harperland *by* Sir Walter.

1187 **II.** (£5.)—SIR MARK J. MCTAGGART STEWART, BT., M.P., Southwick, Dumfries, for **Betty 10625**, white with brown spots, born March 21; *s.* Adjutant of South Cumberland 1819, *d.* Betty of Southwick.

1188 **R. N. & H. C.**—SIR MARK J. MCTAGGART STEWART, BT., M.P.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 131.—*Ayrshire Heifers, calved in* 1897.
[4 entries, none absent.]

1189 I. (£10.)—ANDREW MITCHELL, Barcheskie, Kirkcudbright, for **Cherry 3rd**, white and brown, born April 3, bred by Thomas Barr, Monkland, Kilmarnock; *s.* White Cockade of Nether Craig 2852, *d.* White Rose of Monkland 9587 *by* Snowball of Alticane 2323.

1190 II. (£5.)—ANDREW MITCHELL, for **Nell Gwynne**, white and brown, born April 12; *s.* Field Marshal of Cavens 3015, *d.* Nora 2nd of Barcheskie *by* Blairquhan.

1192 **R. N. & H. C.**—SIR MARK J. MCTAGGART STEWART, BT., M.P., for **Rosebud 2nd.**

Jerseys.

N.B.—In the Jersey Classes the number inserted within brackets after the name of an animal indicates the number of such animal in the Island Herd Book. A number without brackets indicates that the animal is registered in the English Jersey Herd Book.

Class 132.—*Jersey Bulls, calved in* 1894, 1895, *or* 1896.
[20 entries, 3 absent.]

1196 I. (£15.)—J. BRUTTON, 7 Princes St., Yeovil, for **Golden Lad 5567**, dark brown, born Apr. 9, 1894; *s.* Useful 4730, *d.* Golden Lass 5th *by* Vulcan 3906.

1203 II. (£10.)—THE COUNTESS OF LONSDALE, Barley Thorpe, Oakham, for **Racer**, dark fawn, born Jan. 17, 1895, bred by Noel Gorvel, St. Helier's, Jersey; *s.* Golden Hero 4857, *d.* La Fontaine's Mabel (6910) F.S.C.

1199 III. (£5.)—MRS. DRING, Rockgrove, Little Island, co. Cork, for **Scrapper**, fawn, born June 12, 1896, bred by J. P. Falle, St. Mary's, Jersey; *s.* Uncle Peter (2115), *d.* Jenny 3rd (3567).

1204 **R. N. & H. C.**—HARRY MCCALMONT, M.P., for **Rome.**

H. C.—THE MARQUIS OF ANGLESEY, for No. 1193, **Carnage**; SIR JAMES BLYTH, BT, for No. 1194, **Actor**, and No. 1195, **Crown Prince**; A. E. MCMULLEN, for No. 1206, **Son of a Gun**; P. PHIPPS, for No. 1209, **Rushton Conqueror**; LORD ROTHSCHILD, for No. 1210, **Alicante's Boy.**

Com.—H. C. HODSON, for No. 1200, **Daily Mail**; THE COUNTESS OF LONSDALE, for No. 1202, **Mr. Bee**; PROF. A. B. SKIPWORTH, for No. 1212.

Class 133.—*Jersey Bulls, calved in* 1897. [28 entries, 5 absent.]

1223 I. (£10.)—MRS. CYRIL E. GREENALL, Walton Hall, Warrington, for **Golden Monarch**, dark brown, born Jan. 7, bred by John Dicland, Trinity, Jersey; *s.* Golden Lad 2nd (2023), *d. by* Agenoria 3rd (1125).

1217 II. (£5.)—EARL CADOGAN, K.G., Culford Hall, Bury St. Edmunds, for **Blucher**, silver grey, born April 14; *s.* Spartan (vol. vii p. 82), *d.* Besika *by* Nevada 5302.

1229 **R. N. & H. C.**—HARRY MCCALMONT, M.P., for **Chancellor.**

H. C.—MRS. WALTER BARRON, for No. 1215, **Phyl**; W. MCKENZIE BRADLEY, for No. 1216, **Speculator**; MRS DRING, for No. 1219, **Blacksmith**; THE COUNTESS OF LONSDALE, for No. 1227, **Pattern Boy**; HARRY MCCALMONT, M.P, for No. 1228, **Censor**; MRS. CHARLOTTE MCINTOSH, for No. 1230, **Havering Butter Boy**, and No. 1231, **Victor**; THE DUKE OF NORTHUMBERLAND, K.G., for No. 1236, **Peter Piper**; LORD ROTHSCHILD, for No. 1238, **Carmolite.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Com.—W. ALEXANDER, JUN., for No. 1213, **Brigadier**; CHARLES KNIGHT, for No. 1225, **Mab's Lad**; A. E. MCMULLEN, for No. 1233, **Reliance**; R. J. POPE, for No. 1237, **Angler's Boy**; W. G. M. TOWNLEY, for No. 1240, **Perry Farm Trooper**.

Class 134.—*Jersey Cows (in-milk), calved before or in* 1895. [32 entries, 10 absent.]

1270 **I.** (£15.)—LORD ROTHSCHILD, Tring Park, Herts, for **Regina's Sultana 2nd** (vol. vii. p. 226), dark fawn and white, born Feb. 20, 1893, in-milk, calved May 14, 1898, bred by Phil Ozouf, St. Saviour's, Jersey; *s.* Orme 4296, *d.* Regina's Sultana (7686).

1265 **II.** (£10.)—THE DUKE OF MARLBOROUGH, Blenheim Palace, Woodstock, for **Happy Girl** (vol. vi. p. 316), fawn, born Dec. 2, 1893, in-milk, calved May 1, 1898; *s.* Perry Farm Rosy's Boy 3635, *d.* Lady Gordon 3rd *by* Nestor 4th 3575.

1247 **III.** (£5.)—W. MCKENZIE BRADLEY, Leylands, Meopham, Kent, for **Golden Name** (5526) H.C., whole colour, born Dec. 8, 1892, in-milk, calved April 27, 1898, bred by A. J. Arthur, St. Ouen's, Jersey; *s.* Golden Lad 3324, *d.* Nameless (3222).

1249 **R. N. & H. C.**—W. MCKENZIE BRADLEY, for **Melvina 3rd**.

H. C.—SIR JAMES BLYTH, BT., for No. 1244, **Brown Bess**, and No. 1246, **Tenby**; ANTONY GIBBS, for No. 1256, **Buttercup 3rd**, and No. 1257, **Lass of Jersey 2nd**; MRS. CYRIL E. GREENALL, for No. 1258, **Daisy of the Valley**, No. 1259, **Mona 10th**, and No. 1260, **Sweet Eyes**; HARRY MCCALMONT, M.P., for No. 1263, **Wigton 6th**; R. J. POPE, for No. 1267, **Handsome 2nd**; LORD ROTHSCHILD, for No. 1269, **Dairy's Golden**; THE DUCHESS OF WELLINGTON, for No. 1272, **Brown Fern 6th**.

1253 **Com.**—FOWLER AND DE LA PERRELLE, for **Beeswing 3rd**.

Class 135.—*Jersey Heifers (in-milk or in-calf), calved in* 1896. [41 entries, 12 absent.]

1280 **I.** (£15.)—JOSEPH BRUTTON, 7 Princes Street, Yeovil, for **Dulce**, brown, born April 3, in-milk, calved May 13, 1898, bred by J. J. Maillard, St. Peter's, Jersey; *s.* Golden Lad (1242), *d.* Down (4068) *by* The Bard (962).

1312 **II.** (£10.)—LORD ROTHSCHILD, Tring Park, Herts, for **Tulip 7th** (vol. viii. p. 29), dark fawn, born March 27, in-milk, calved April 19, 1898; *s.* Spot's Lad 4389, *d.* Tulip *by* Sultane's Favourite.

1291 **III.** (£5.)—MRS. CYRIL E. GREENALL, Walton Hall, Warrington, for **Longueville Brownie 4th**, fawn, born Jan. 30, in-milk, calved June 9, 1898, bred by P. Arthur, St. Saviour's Jersey; *s.* Hope (1948), *d.* Longueville Brownie 2nd (5462).

1311 **R. N. & H.C.**—LORD ROTHSCHILD, for **Golden Lady**.

H. C.—W. ALEXANDER, JUN., for No. 1273, **Fairy**, and No. 1274, **Good Sister**; SIR JAMES BLYTH, BT., for No. 1278, **Distinction's Trilby**; MRS. DRING, for No. 1282, **Favourite**, and No. 1283, **Playmate**; FOWLER AND DE LA PERRELLE, for No. 1289, **Post Stamp 6th**; MRS. CYRIL E. GREENALL, for No. 1292, **Regalia**; HARRY MCCALMONT, M.P., for No. 1297, **Orange Lily**; MRS. CHARLOTTE MCINTOSH, for No. 1300, **Starlight**; THE DUKE OF MARLBOROUGH, for No. 1304, **Egyptienne 4th**; R. J. POPE, for No. 1309, **Nellie Beresford**; LORD ROTHSCHILD, for No. 1310, **Clemence 5th**; THE DUCHESS OF WELLINGTON, for No. 1313, **Myrtle Beresford**.

Com.—W. ALEXANDER, JUN., for No. 1275, **Jennet**; ANTONY GIBBS, for No. 1290, **Matilda**; A. E. MCMULLEN, for No. 1301, **White Socks**; THE MAISONNETTE DAIRY CO., LTD., for No. 1302, **Ancona**; P. PHIPPS, for No. 1306, **Clement's Surprise**; R. J. POPE, for No. 1308, **Golden Lily 3rd**.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 136.—*Jersey Heifers, calved in* 1897. [37 entries, 4 absent.]

1314 I. (£15.)—MRS. WALTER BARRON, Taplow House, Bucks, for **Lady of the Lake 8th**, greyish fawn, born May 14, bred by the late Walter Barron, Taplow House; *s.* Dora's Champion 5142, *d.* Lady of the Lake 5th (vol. vi. p 322) *by* Viola's Pride.

1333 II. (£10.)—MRS. CHARLOTTE McINTOSH, Havering Park, Romford, for **Havering Carnatic**, brown, born April 21; *s.* Mont Pellier 5294, *d.* Carnatic 2nd (5622) *by* Rosebay's Lad 1730.

1322 III. (£5.)—EARL CADOGAN, K.G., Culford Hall, Bury St. Edmunds, for **Golden Sheaf**, fawn, born May 2; *s.* Spartan (vol. vii.), *d.* Golden Butterfly *by* Golden Fluke 4557.

1346 **R. N. & H. C.**—LORD ROTHSCHILD, for **Jewel.**

H. C.—W. McKENZIE BRADLEY, for No. 1321, **Leyland's Queen**; EARL CADOGAN, K.G., for No. 1323, **Spray**; MRS. CYRIL E. GREENALL, for No. 1328, **Princess Mona**; CHARLES KNIGHT, for No. 1329, **Speculation**; THE COUNTESS OF LONSDALE, for No. 1330, **The Fancy**; MRS. CHARLOTTE McINTOSH, for No. 1332, **Havering Buttercup**; MAURICE MARCUS, for No. 1339, **Patience 2nd**, and No. 1340, **Vanille 2nd**; LORD ROTHSCHILD, for No 1344, **Brown Lass of Carteret**, and No. 1345, **Clemence 6th**; THE DUCHESS OF WELLINGTON, for No. 1350, **Jubilee.**

Com.—SIR JAMES BLYTH, BT., for No. 1316, **Oompah's Chance**; MRS. CYRIL E. GREENALL, for No. 1327, **Onyx**; THE MAISONNETTE DAIRY CO., LIM., for No. 1337, **Maisonnette Marcella**, and No. 1338, **Maisonnette Marie**; W. G. M. TOWNLEY, for No. 1319, **Golden Pink.**

Guernseys.

N.B.—Unless otherwise stated, the numbers refer to the English Guernsey Herd Book.

Class 137.—*Guernsey Bulls, calved in* 1894, 1895, *or* 1896. [16 entries, 3 absent.]

1351 I. (£15.)—THE HON. MRS. A. BAILLIE-HAMILTON, Burley Lodge, Ringwood, Hants, for **His Majesty** 952 P.S., R.G.A.S., fawn and white, born April 2, 1894, bred by Thomas Le Prévost, L'Etiennerie, Castel, Guernsey; *s.* Lord Mortimer 2nd 713 P.S., R.G.A.S., *d.* Lady Saumarez Cora 2570 P.S., R.G.A.S. *by* Lord Mortimer.

1358 II. (£10.)—W. A. GLYNN, Seagrove, Seaview, Isle of Wight, for **Frolic 6th** 899, orange, fawn and white, born Feb. 28, 1896; *s.* Frolic 5th 612, *d.* Favourite 9th 760 *by* Hopeful 25.

1352 III. (£5.)—JOHN C. FORSTER, Clatford Mills, Andover, for **Uncle Peter** 1061, red and white, born July 24, 1895, bred by P. Martel, Masse, Castel, Guernsey; *s.* Our Paradox 873 P.S., R.G.A.S., *d.* Elmira 1976 F.S., R.G.A.S.

1356 **R. N. & H. C.**—H. J. GIBBS, Milford, Salisbury, for **Crofton Brian.**

Class 138.—*Guernsey Bulls, calved in* 1897. [11 entries, 3 absent.]

1375 I. (£10.)—COL. H. W. SHAKERLEY, Burgate, Godalming, for **Captain Parry** 971, fawn, born Jan. 12, bred by A. Brehaute, Pages, St. Martin's, Guernsey; *s.* Captain Lyons 1st 1061 P.S., R.G.A.S., *d.* Petite 5th 3945 P.S., R.G.A.S.

1374 II. (£5.)—SIR F. A. MONTEFIORE, BT., Worth Park, Crawley, for **Signalman 2nd** 1048, fawn and white, born Feb. 22; *s.* Signalman 585, *d.* Miranda 6th 2253 *by* Yeoman 454.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1376 **R. N. & H. C.**—JULIAN STEPHENS, Grove Ho., Finchley, for **May Day.**
1368 **H. C.**—THEODORE BOSANQUET, for **Prince Charlie 4th.**

Class 139.—*Guernsey Cows or Heifers (in-milk or in-calf), calved before or in* 1895. [20 entries, 4 absent.]

1393 **I.** (£15.)—JULIAN STEPHENS, Grove House, Finchley, for **Muriel 6th** 2765, fawn and white, born Dec. 14, 1894, in-milk, calved May 10, 1898; *s.* Express 609, *d.* Muriel 4th 1984 *by* May Boy 346.

1390 **II.** (£10.)—SIR F. A. MONTEFIORE, BT., Worth Park, Crawley, for **Claremont Flora** 3288, fawn and white, born Feb. 2, 1892, in-milk, calved April 29, 1898, bred by A. Hansferd, St. Peter's Port, Guernsey; *s.* Deputy, *d.* Starlight.

1388 **III.** (£5.)—MRS. HEYWOOD-LONSDALE, Cloverley, Whitchurch, Salop, for **Shavington Fringe** 2795, orange, fawn and white, born April 12, 1894, in-milk, calved May 22, 1898, in-calf, bred by the late A. P. Heywood-Lonsdale, Cloverley; *s.* Mayfly 491, *d.* Shavington Freda *by* May Duke 257.

1384 **R. N. & H. C.**—W. A. GLYNN, for **Jessica 4th.**
H. C.—THE HON MRS A. BAILLIE-HAMILTON, for No. 1379, **Jessie 10th**; E. A. HAMBRO, for No. 1386, **Richesse du Chêne 2nd**, and No. 1387, **Rose of Ville Amphrey.**

1391 **Com.**—SIR F. A. MONTEFIORE, BT., for **Silvester.**

Class 140.—*Guernsey Heifers, calved in* 1896. [13 entries, 2 absent.]

1404 **I.** (£10.)—W. A. GLYNN, Seagrove, Seaview, Isle of Wight, for **Florry 5th** 3368, orange, fawn and white, born June 16; *s.* Frolic 5th 612, *d.* Florry 3rd 1862 *by* Tommy 2nd 378.

1400 **II.** (£5.)—W. HERBERT FOWLER, Claremont, Taunton, for **Claremont Jasemine**, pale red and white, born Jan. 28, bred by Mrs. M. de Garis Lainé, St. Saviour's, Guernsey; *s.* Orange Boy 901 P.S., R.G.A.S., *d.* Silvester 5th 2837 P.S., R.G.A.S. *by* Captain 513 P.S., R.G.A.S.

1409 **R. N. & H. C.**—JULIAN STEPHENS, Grove Ho., Finchley, for **Puppy 4th.**

Class 141.—*Guernsey Heifers, calved in* 1897. [19 entries, 1 absent.]

1413 **I.** (£10.)—JOHN C. FORSTER, Clatford Mills, Andover, for **Antona 7th** 3593, red and white, born May 26; *s.* Young Sarnia 848, *d.* Antona 5th 2851 *by* Young Sarnia 848.

1425 **II.** (£5.)—MRS. H. C. STEPHENS, Avenue House, Finchley, for **Nora 10th** 3882, pale fawn and white, born April 2; *s.* Ambassador 656, *d.* Nora 7th 1685 *by* Original 262.

1422 **R. N. & H. C.**—SIR F. A. MONTEFIORE, BT., for **Fair Valentine 5th.**
H. C.—H. J. GIBBS, for No. 1418, **Milford Betsy**; W. A. GLYNN, for No. 1419, **Favourite 22nd**, and No. 1420, **Honesty 16th.**

1421 **Com.**—E. A. HAMBRO, for **Hayes Bonnie 2nd.**

Kerries.

Class 142.—*Kerry Bulls, calved in* 1895, 1896, *or* 1897. [8 entries, none absent.]

1432 **I** (£10, & Champion.[1])—C. B. MARLAY, Belvedere House, Mullingar, co. Westmeath, for **Marquis** 377, born May 17, 1897; *s.* Belvedere Prince of Leinster 353, *d.* Belvedere Maggie 2nd 2224 *by* Conor O'Moore 128.

[1] Prize, value £10 10s., given by the Kerry and Dexter Cattle Society for the best Kerry animal in Classes 142-143.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1437 II. (£5, & R. N. for Champion.[1])—ROBERTSON & SONS, Church Farm, Babraham, Cambridge, for **La Mancha Beau** 388, born June 1, 1897; *s.* Babraham Beau 240, *d.* Blarney 1504 *by* Blackamoor 246.

1434 R. N. & H. C.—W. H. MULLENS AND R. W. STENT, for **Coco**; and H. C. for No. 1433, **Blacksmith.**

Class 143.—*Kerry Cows or Heifers (in-milk or in-calf), of any age.* [10 entries, 1 absent.]

1444 I. (£10.)—THE DUCHESS OF NEWCASTLE, Clumber, Worksop, for **Aicme Clara** 2005, born April, 1890, in-milk, calved May 5, 1898, breeder unknown.

1447 II. (£5.)—ROBERTSON & SONS, Church Farm, Babraham, Cambridge, for **La Mancha Fan**, born 1896, in-milk, calved March 16, 1898, breeder unknown.

1445 R. N. & H. C.—THE DUCHESS OF NEWCASTLE, for **Killarney.**
H. C.—JOHN H CALVERT, for No. 1438, **Kitty**; ROBERTSON & SONS, for No. 1446, **Greenagh Cowslip.**

1440 Com.—THE EARL OF CLONMEL, for **Susan.**

Dexters.

Class 144.—*Dexter Bulls, calved in* 1895, 1896, *or* 1897. [9 entries, none absent.]

1456 I. (£10, & Champion.[2])—E. SYDNEY WOODIWISS, Westbury Farm, Upminster, for **Simple Simon**, black, born 1896, breeder unknown.

1453 II. (£5, & R. N. for Champion.[2])—ROBERTSON & SONS, Church Farm, Babraham, Cambridge, for **Taney 5th**, black, born Nov. 1, 1896, bred by F. E. Ball, Taney House, Dundrum, co. Dublin; *s.* Taney 4th 304, *d.* Taney Nancy 369 *by* Limelight 12.

1448 R. N. & H. C.—H.R.H. THE PRINCE OF WALES, K G.
H. C.—F. H. BAXENDALE, for No. 1449, **Framfield Paragon**; W. STALLARD, for No. 1454, **Redmarley.**

Class 145.—*Dexter Cows or Heifers (in-milk or in-calf), of any age.* [13 entries, 1 absent.]

1462 I. (£10.)—COUNTESS DE LA WARR, Manor House, Bexhill-on-Sea, for **Framfield Opal** 811, red, born 1893, in-milk, calved March 20, 1898, breeder unknown.

1468 II. (£5.)—E. SYDNEY WOODIWISS, Westbury Farm, Upminster, for **La Mancha Sweet Lavender** 937, black, born 1895, in-milk, calved April 28, 1898, breeder unknown.

1457 R. N. & H. C.—H.R.H. THE PRINCE OF WALES, K G, for **Dainty Girl.**
H. C.—N. C. COOKSON, for No. 1461, **First Love**; W. STALLARD, for No. 1465, **Cryptomeria**; E. SYDNEY WOODIWISS, for No. 1469, **Weekate.**

1458 Com.—FRED ARMSTRONG, for **Forest Beauty.**

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[1] Prize, value £10 10s, given by the Kerry and Dexter Cattle Society for the best Kerry animal in Classes 142–143.

[2] Prize, value £10 10s, given by the Kerry and Dexter Cattle Society for the best Dexter animal in Classes 144–145.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

DAIRY CATTLE.

Class 146.—*Dairy Cows (in-milk), of the Shorthorn, Ayrshire, or other pure breed not named in Class 147, judged for the yield and quality of their milk combined, the milk to contain 12 per cent. of total solids, of which not less than 3 per cent. shall be fat.* [7 entries, 1 absent.]

1472 I. (£15.)—JOHN EVENS, Burton, Lincoln, for **White Foot** (vol. iii. p. 37) (Lincolnshire Red Shorthorn), born Dec. 11, 1891, calved April 25, 1898; *s.* Burgh, *d.* Strawberry 2nd *by* Beauty Bull.

1470 II. (£10.)—JOHN EVENS, for **Old Profit** (vol. i. p. 45) (Lincolnshire Red Shorthorn), born Dec. 29, 1887, calved March 27, 1897; *s.* Beauty Bull, *d.* No. 20 *by* Hag 134.

1473 III. (£5.)—MRS. FRANCES PRATT, Camp Hill, Henley-in-Arden, for **Mayflower** (Shorthorn), white, born July 2, 1892, calved May 20, 1898; *s.* Drummer, *d.* Royal Duchess *by* Barrington Emperor 56924.

Class 147.—*Dairy Cows (in-milk), of the Jersey, Guernsey, Kerry or Dexter breeds, judged for their butter-producing qualities.* [15 entries, 4 absent.]

1477 I. (£15.)—EARL CADOGAN, K.G., Culford Hall, Bury St. Edmunds, for **Clemency** (vol. vi. p. 314) (Jersey), fawn, born June 14, 1892, calved May 10, 1898; *s.* Royal Boy 4358, *d.* Lady Clementine *by* Mourier King.

1181 II. (£10.)—MRS. CHARLOTTE MCINTOSH, Havering Park, Romford, for **Zenobia 34th** (vol. vi. p. 637) (Jersey), fawn and white, born Sept. 25, 1891, calved April 18, 1898; *s.* Peeping Tom 3628, *d.* Zenobia 23rd *by* Golden Rocket 2479.

1478 III. (£5.)—JOHN H. CALVERT, Sunnyside, Masham, R.S.O., Yorks, for **Babraham Belladonna** 1188 (Kerry), born May 14, 1892, calved April 13, 1898, bred by C. R. W. Adeane, Babraham, Cambridge; *s.* Blackamoor 246, *d.* Babraham Belle 133.

1485 R. N. & H. C.—MRS. CHARLOTTE MCINTOSH, for **Zenobia 35th.**

Class 148.—*Dairy Cows (in-milk), of any weight, breed, or cross, giving the largest quantity of milk, containing 12 per cent. of total solids, of which not less than 3 per cent. shall be fat (particulars of breeding to be stated).* [2 entries, 1 absent.]

1493 I. (£15.)—SAMUEL S. RAINGILL, The Grange, Ringway, Altrincham, for roan (Shorthorn and Ayrshire Cross), born May, 1892, calved June 4, 1898, bred by J. Clarkson, Wood Lane, Mobberley.

Class 149.—*Pairs of Dairy Cows (in-milk), of any breed or cross.*[1] [8 entries, 3 absent.]

1499 I. (£15.)—J. F. SPENCER, Hornsey Lane Farm, Highgate, for roan (Shorthorn), born about 1892, calved May 13, 1898, breeder unknown: and roan (Shorthorn), born about 1892, calved June 5, 1898, breeder unknown.

[1] Prizes given by the Birmingham Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1500 **II.** (£10.)—J. F. SPENCER, for roan (Shorthorn), born about 1892, calved April 23, 1898, breeder unknown: and roan (Shorthorn), born about 1893, calved May 31, 1898, breeder unknown.

1497 **R. N.**—MRS. FRANCES PRATT, for **Dairymaid's Daughter.**

SHEEP.

Leicesters.

Class 150.—*Leicester Two-Shear Rams.* [4 entries, 2 absent.]

1504 **I.** (£10.)—J. J. SIMPSON, Pilmoor House, Hunmanby, Yorks, for **Kyber**, born Mar.; *s.* Serang 268.

1503 **R. N.**—E. F. JORDAN, Eastburn, Driffield.

Class 151.—*Leicester Shearling Rams.* [13 entries, 1 absent.]

1509 **I.** (£15.), & 1510 **III.** (£5.)—GEORGE HARRISON, Gainford Hall, Darlington, born Mar.

1512 **II.** (£10.)—E. F. JORDAN, Eastburn, Driffield, born Mar.
1508 **R. N. & H. C.**—GEORGE HARRISON, born Mar.
1511 **H. C.**—E. F. JORDAN, born Mar.
Com.—E. F. JORDAN, for No. 1513; F. W. D. WATKINSON, for No. 1516.

Class 152.—*Pens of Three Leicester Ram Lambs, dropped in* 1898. [6 entries, none absent.]

1523 **I.** (£10.)—J. J. SIMPSON, Pilmoor House, Hunmanby, Yorks, born Feb.; *s.* Royal Jubilee.

1520 **II.** (£5.)—GEORGE HARRISON, Gainford Hall, Darlington, born Mar.
1524 **R. N. & H. C.**—F. W. D. WATKINSON, Weaverthorpe, York.
1521 **H. C.**—E. F. JORDAN, Eastburn, Driffield.

Class 153.—*Pens of Three Leicester Shearling Ewes, of the same Flock.* [8 entries, 1 absent.]

1525 **I.** (£15.)—GEORGE HARRISON, Gainford Hall, Darlington, born Mar.
1530 **II.** (£10.) & 1529 **III.** (£5.)—J. J. SIMPSON, Pilmoor House, Hunmanby, Yorks, born Mar.; *s.* Rupee 331.

1532 **R. N. & H. C.**—F. W. D. WATKINSON, Weaverthorpe, York.
1526 **H. C.**—G. HARRISON. **Com.**—E. F. JORDAN, for Nos. 1527 & 1528.

Class 154.—*Pens of Three Leicester Ewe Lambs, dropped in* 1898. [4 entries.]

1536 **I.** (£10.)—J. J. SIMPSON, Pilmoor House, Hunmanby, Yorks, born Feb.; *s.* Royal Jubilee.

1534 **II.** (£5.)—E. F. JORDAN, Eastburn, Driffield, born Mar.
1533 **R. N. & H. C.**—GEORGE HARRISON. 1535 **H. C.**—MRS. PERRY-HERRICK.

Cotswolds.

Class 155.—*Cotswold Two-Shear Rams.* [5 entries, 1 absent.]

1538 **I.** (£10.) & 1539 **II.** (£5.)—R. & W. T. GARNE, Aldsworth, Northleach, born Jan.

1541 **R. N.**—WM. HOULTON, Broadfield, Northleach, for **Thumper**, born Feb.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 156.—*Cotswold Shearling Rams.* [10 entries, 2 absent.]

1544 **I.** (£15.), & 1545 **II.** (£10.)—R. & W. T. GARNE, Aldsworth, Northleach, born Jan.

1550 **III.** (£5.) RUSSELL SWANWICK, R.A.C. Farm, Cirencester, born Jan.; *s.* 736, *d. by* West Dereham 384.

1548 **R. N. & H. C.**—W. HOULTON, Broadfield, Northleach.

1551 **H. C.**—RUSSELL SWANWICK.
Com.—R. & W. T. GARNE, for No. 1546; HARRY McCALMONT, M.P., for No. 1549, **Neptune.**

Class 157.—*Pens of Three Cotswold Ram Lambs, dropped in* 1898. [7 entries, 3 absent.]

1557 **I.** (£10.), & 1558 **II.** (£5.)—RUSSELL SWANWICK, R. A. C. Farm, Cirencester, born Jan.

1554 **R. N. & H. C.**—R. & W. T. GARNE, Aldsworth, Northleach.

Class 158.—*Pens of Three Cotswold Shearling Ewes of the same Flock.* [5 entries, none absent.]

1559 **I.** (£15.), 1561 **II.** (£10.), & 1560 **III.** (£5.)—R. & W. T. GARNE, Aldsworth, Northleach.

Class 159.—*Pens of Three Cotswold Ewe Lambs, dropped in* 1898. [5 entries, 3 absent.]

1565 **I.** (£10.), & 1566 **R. N. & H. C.**—R. & W. T. GARNE, Aldsworth, Northleach.

Lincolns.

Class 160.—*Lincoln Two-Shear Rams.* [8 entries, 1 absent.]

1575 **I.** (£10, & **R. N. for Champion.**[1])—JOHN PEARS, Mere, Lincoln, for **Dowsby Corrector**, born Feb., bred by S. E. Dean & Sons, Folkingham; *s.* **Lincoln 152 Guineas 1436.**

1570 **II.** (£5.)—J. E. CASSWELL, Laughton, Folkingham, for **Laughton What's Wanted**, born Feb.; *s.* **Lincoln 152 Guineas 1436**, *d. by* Judge 196.

1573 **R. N. & H. C.**—S. E. DEAN & SONS, for **Dowsby Selection.**
H. C.—J. E. CASSWELL, for No. 1569, **Laughton Perfection**; T. R. & H. CASSWELL, for No. 1571, **Quadring Choice.**

Class 161.—*Lincoln Shearling Rams.* [27 entries, 3 absent.]

1590 **I.** (£15, & **Champion.**[1]), 1589 **II.** (£10.) & 1588 **III.** (£5.)—HENRY DUDDING, Riby Grove, Stallingborough, Lincs, born Feb.

1597 **R. N. & H. C.**—HENRY SMITH, JUN., for **Cropwell Recorder.**
H. C.—JOHN ANDERSON, for No. 1577; J. E. CASSWELL, for No. 1578 & No. 1579; TOM CASSWELL, for No. 1581; T. R. & H. CASSWELL, for No. 1583; S. E. DEAN & SONS, for No. 1584; THOMAS DIGGLE, for No. 1586; JOHN PEARS, for No. 1594; HENRY SMITH, JUN., for No. 1596, **Cropwell Agitator**; R. & W. WRIGHT, for No. 1601 & No. 1602.

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[1] Prize, value £10 10s., given by the Lincoln Long Wool Sheep Breeders' Association for the best Lincoln Ram in Classes 160-161.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 162.—*Pens of Five Lincoln Shearling Rams.*[1]
[11 entries, 2 absent.]

1614 I. (£15.)—R. & W. WRIGHT, Nocton Heath, Lincoln, born Feb.
1608 II. (£10.)—HENRY DUDDING, Riby Grove, Stallingborough, born Feb.
1611 III. (£5.)—JOHN PEARS, Mere, Lincoln, born Feb.
1605 R. N. & H. C.—J. E. CASSWELL, Laughton, Folkingham.
H. C.—TOM CASSWELL, for No. 1606; S. E. DEAN & SONS, for No. 1607; THOMAS HERD, for No. 1610.
Com.—J. ANDERSON, for No. 1601; H. SMITH, JUN., for No. 1612.

Class 163.—*Pens of Three Lincoln Ram Lambs, dropped in* 1898.
[12 entries, 2 absent.]

1626 I. (£10.)—R. & W. WRIGHT, Nocton Heath, Lincoln, born Feb.
1620 II. (£5.)—HENRY DUDDING, Riby Grove, Stallingborough, born Feb.
1623 R. N. & H. C.—JOHN PEARS, Mere, Lincoln.
H. C.—H. DUDDING, for No. 1619; H. GOODYEAR, for No. 1621.

Class 164.—*Pens of Three Lincoln Shearling Ewes of the same Flock.*
[7 entries, 2 absent.]

1628 I. (£15.) & 1629 R. N. & H. C.—HENRY DUDDING, Riby Grove, Stallingborough, born Feb.

1632 II. (£10.)—JOHN PEARS, Mere, Lincoln, born Feb.
1631 III. (£5.)—THOMAS HERD, Scothorne Manor, Lincoln, born Feb.; *ss.* Scothorne Thorpe 2236 and Riby 120 Guineas 2990.

Class 165.—*Pens of Three Lincoln Ewe Lambs, dropped in* 1898.
[10 entries, 2 absent.]

1640 I. (£10.)—JOHN PEARS, Mere, Lincoln, born Feb.
1637 II. (£5.) & 1638 R. N. & H. C.—HENRY DUDDING, Riby Grove, Stallingborough, born Feb.

1639 H. C.—HENRY GOODYEAR, Austerby, Bourne.

Oxford Downs.

Class 166.—*Oxford Down Two Shear Rams.*
[8 entries, none absent.]

1645 I. (£10.)—C. HOBBS & SON, Maisey Hampton, Fairford, Glos., born Feb.
1649 II. (£5.)—J. & S. TREADWELL, Upper Winchendon, Aylesbury, for **Duke of York**, born about Feb. 10; *s.* Hopeful 1682, *d. by* Gillet No. 3 1128.

1644 R. N.—J. C. EADY, Irchester Grange, Wellingborough.

Class 167.—*Oxford Down Shearling Rams.* [17 entries, 5 absent.]

1664 I. (£15.)—J. & S. TREADWELL, Upper Winchendon, Aylesbury, born about Feb. 10.

1653 II. (£10.)—JOHN C. EADY, Irchester Grange, Wellingborough, for **Royal Irchester**, born about Feb. 6; *s.* Royal Darling 2158, *d. by* Testerton Royalty 966.

1657 III. (£5.)—C. HOBBS & SON, Maisey Hampton, Fairford, born Feb.
1652 R. N.—THE EARL OF CAMPERDOWN.

[1] Prize given by the Birmingham Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 168.—*Pens of Three Oxford Down Ram Lambs, dropped in* 1898. [8 entries, 1 absent.]

1669 I. (£10.)—WILLIAM ARKELL, Kempsford, Fairford, born Jan. 14; *ss.* Primus 2142 and Arbitrator 1592, *ds. by* Artful 1372 and Audacity 814.
1676 II. (£5.)—A. H. WILSDON, Dornford, Woodstock, born about Jan. 14.
1674 R. N.—GEORGE STREET, Maulden, Ampthill.

Class 169.—*Pens of Three Oxford Down Shearling Ewes, of the same Flock.* [5 entries, none absent.]

1677 I (£15.)—JOHN C. EADY, Irchester Grange, Wellingborough, born about Feb 8; *ss.* Winchendon Hopeful 2204 and Burton Rector, *ds. by* Winchendon Hero 990 and Testerton Royalty 966.

1678 II. (£10.)—JOHN C. EADY, born about Feb. 10; *ss.* Winchendon Hopeful 2204 and Case's Lamb of 1896, *ds. by* Treadwell's No. 8 of 1891 and Testerton Royalty 966.

1680 III. (£5.)—BENJAMIN HOWKINS, Bromham, Bedford, born Jan. 16; *s.* Treadwell's No. 8 of 1895.

1681 R. N. & H. C.—W. A. TREWEEKE, Ryne Hill, Chipping Norton.

Class 170.—*Pens of Three Oxford Down Ewe Lambs, dropped in* 1898. [6 entries, none absent.]

1682 I. (£10.)—W. ARKELL, Kempsford, Fairford, born Jan.; *ss.* Primus 2142 and Arbitrator 1592, *ds. by* Audacity 814 and Testerton 2nd 491.

1684 II. (£5.)—HUGH W. STILGOE, The Grounds, Adderbury, Banbury, born Feb. 1; *ss.* Boney and True Briton.

1683 R. N. & Com.—J. T. GREEN, Hunton Bridge Farm, King's Langley.

Shropshires.

Class 171.—*Shropshire Two-Shear Rams.* [16 entries, none absent.]

1703 I. (£10, & R. N. for Champion.[1])—ALFRED TANNER, Shrawardine, Shrewsbury, for **Diamond King**, bred by Mrs. A. E. Mansell, Harrington Hall, Shifnal, Salop; *s.* Montford Dreamer 7022, *d. by* Fair Star 5177.

1691 II. (£5.)—J. BOWEN-JONES, Ensdon House, Montford Bridge, Salop, born Feb.

1702 R. N. & H. C.—HOWARD P. RYLAND, Moxhull Park, Erdington, Birmingham, for **Odstone Pioneer.**

H. C.—MRS. M. BARRS, for No. 1688; R. P. COOPER, for No. 1693; C. H. JOLLIFFE, for No. 1699; R. RAMSDEN, for No. 1701.

Com.—A. S. BERRY, for No. 1690; T. FENN, for No. 1695; T. S. MINTON, for No. 1700.

Class 172.—*Shropshire Shearling Rams.* [48 entries, 8 absent.]

1718 I. (£15, & Champion.[1])—DAVID BUTTAR, Corston, Coupar Angus, N.B., born Mar.

1708 II. (£10.)—J. BOWEN-JONES, Ensdon Ho., Montford Bridge, born Feb.
1727 III. (£5.)—W. F. INGE, Thorpe Hall, Tamworth, born March.

[1] Gold Medal given by the Shropshire Sheep Flock Book Society for the best Shropshire Ram in Classes 171-172.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1735 **R. N. & H. C.**—T S. MINTON, Montford, Salop.

H. C.—A. BRADBURNE, for No. 1710; D. BUTTAR, for No. 1712; R. P. COOPER, for No. 1718; P. A. & G. T. EVANS, for No. 1719; W. F INGE, for No. 1726; W. KIRKHAM, for No. 1729; T. S. MINTON, for No. 1734; J. L. NAPER, for No. 1737; B. WALL, for No. 1750.

Com.—MRS. BARRS, for No. 1704; D. BUTTAR, for No. 1714; R. P. COOPER, for No. 1716; P. A. & G. T. EVANS, for No. 1720, J. HARDING, for No. 1723; B. WALL, for No. 1751.

Class 173.—*Pens of Five Shropshire Shearling Rams.*[1] [19 entries, 1 absent.]

1755 **I.** (£15)—DAVID BUTTAR, Corston, Coupar Angus, N.B., born Mar.
1752 **II.** (£10.)—MRS. MARIA BARRS, Odstone Hall, Atherstone, born Mar.
1754 **III.** (£5.)—J. BOWEN-JONES, Ensdon Ho., Montford Bridge, born Feb.
1760 **R. N. & H. C.**—JOHN HARDING, Norton House, Shifnal.

H. C.—T F. CHEATLE, for No 1756; R. P. COOPER, for No. 1757; P. A. & G. T. EVANS, for No. 1758; T. FENN, for No. 1759; W. F. INGE, for No. 1762; W. KIRKHAM, for No. 1764; PHILO L. MILLS, for No. 1765; T. S. MINTON, for No. 1766; A. TANNER, for No. 1769.

Com.—A. S. BERRY, for No. 1753; G. L. FOSTER HARTER, for No. 1761; C. H. JOLLIFFE, for No. 1763; H. C. G. PARKER, for No. 1768; W. THOMAS, for No. 1770.

Class 174—*Pens of Three Shropshire Ram Lambs, dropped in* 1898. [20 entries, 5 absent.]

1771 **I.** (£10.)—MRS. MARIA BARRS, Odstone Hall, Atherstone, born Mar.
1778 **II.** (£5.)—P. A. & G. T. EVANS, Shelvlowe, Salop, born Feb. & Mar.
1784 **R. N. & H. C.**—PHILO L. MILLS, Ruddington Hall, Notts.

H. C.—A. BRADBURNE, for Nos. 1773 and 1774; J. HARDING, for No. 1779; R. RAMSDEN, for No. 1788; A. TANNER, for No. 1789.

Com.—H. BRADBURNE, for No. 1775; R. P. COOPER, for No. 1777; W. THOMAS, for No. 1790.

Class 175.—*Pens of Three Shropshire Shearling Ewes, of the same Flock.* [19 entries, 3 absent.]

1794 **I.** (£15.)—R. P. COOPER, Shenstone Court, Lichfield, born Feb.
1804 **II.** (£10)—J. LENOX NAPER, Loughcrew, Oldcastle, co. Meath, born Mar.
1791 **III.** (£5.)—MRS. MARIA BARRS, Odstone Hall, Atherstone, born Mar.
1809 **R. N. & H. C.**—BERNARD WALL, Hazlewood, Coleshill.

H. C.—P. A. & G. T. EVANS, for No. 1795; T. FENN, for No. 1796; W. F. INGE, for Nos. 1798 and 1799, PHILO L. MILLS, for No. 1802.

Com.—E. NOCK, for No. 1805; A. TANNER, for No. 1808.

Class 176.—*Pens of Ten Shropshire Ewes, having bred and suckled Lambs in* 1898.[1] [7 entries.]

1815 **I.** (£15.)—PHILO L. MILLS, Ruddington Hall, Notts, born 1894, 1895, & 1896.

1816 **II.** (£10)—ALFRED TANNER, Shrawardine, Shrewsbury, born 1894, 1895, & 1896.

1813 **III.** (£5.)—R. P. COOPER, Shenstone Court, Lichfield, born 1895 & 1896.

[1] Prizes given by the Birmingham Local Committee.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1811 **R. N. & H. C.**—J. BOWEN-JONES, Ensdon House, Montford Bridge.
1814 **H. C.**—G. L. FOSTER HARTER.
Com.—A. S. BERRY, for No. 1810; A. BRADBURNE, for No. 1812.

Class 177.—*Pens of Three Shropshire Ewe Lambs, dropped in* 1898. [18 entries, 5 absent.]

1817 I. (£10.)—MRS. MARIA BARRS, Odstone Hall, Atherstone, born Mar.
1833 II. (£5.)—A. TANNER, Shrawardine, Shrewsbury, born about Mar. 1.
1819 **R. N. & H. C.**—ARTHUR BRADBURNE, Moat Bank, Lichfield.
H. C.—G. L. FOSTER HARTER, for No. 1825; PHILO L. MILLS, for No. 1829.
Com.—R. RAMSDEN, for No. 1832; W. THOMAS, for No. 1834.

Southdowns.

Class 178.—*Southdown Two-Shear Rams.* [15 entries, 1 absent.]

1844 I. (£10.)—ERNEST MATHEWS, Chequers Mead, Potters Bar, born Feb.; *s.* Count 10th 1008.

1840 II. (£5.)—J. J. COLMAN, Carrow House, Norwich, born Feb.

1843 **R. N. & H. C.**—A. HEASMAN, Court Wick, Littlehampton.
Com.—THE PAGHAM HARBOUR CO., for No. 1845; THE DUKE OF RICHMOND AND GORDON, K.G., for No. 1846.

Class 179.—*Southdown Shearling Rams.* [29 entries, 1 absent.]

1863 I. (£15.), & 1861 II. (£10.)—J. J. COLMAN, Carrow House, Norwich, born Feb.

1872 III. (£5.), & 1873 (R. N. & H. C.)—PAGHAM HARBOUR CO., Selsey, Chichester, born about Feb. 15.

H. C.—SIR JAMES BLYTH, BT., for No. 1858; A. HEASMAN, for Nos. 1867 and 1868; E. MATHEWS, for No. 1869.

Class 180.—*Pens of Three Southdown Ram Lambs, dropped in* 1898. [14 entries, 2 absent.]

1891 I. (£10.)—PAGHAM HARBOUR CO., Selsey, Chichester, born Feb.
1892 II. (£5.)—WILLIAM TOOP, Aldingbourne, Chichester.
1887 **R. N. & H. C.**—A. HEASMAN. 1888 **H. C.**—ERNEST MATHEWS.
Com.—C. R. W. ADEANE, for No. 1881; J. J. COLMAN, for No. 1885; T. MILES, for No. 1889.

Class 181.—*Pens of Three Southdown Shearling Ewes, of the same Flock.* [12 entries, 1 absent.]

1895 I. (£15.)—SIR JAMES BLYTH, BT., Blythwood, Stansted, born about Feb. 15.

1904 II. (£10.)—WILLIAM TOOP, Aldingbourne, Chichester, born Feb. 28.

1900 III. (£5.)—PAGHAM HARBOUR CO., Selsey, Chichester, born about Feb. 15.

1901 **R. N. & H. C.**—THE DUKE OF RICHMOND AND GORDON, K.G.
Com.—H.R.H. THE PRINCE OF WALES, K.G., for No. 1893; EARL BATHURST, for No. 1894; EARL CADOGAN, K.G., for No. 1897; J. J. COLMAN, for No. 1898; T. MILES, for No. 1899; THE DUKE of RICHMOND AND GORDON, K.G., for No. 1902; SIR W. THROCKMORTON, BT., for No. 1903.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 182.—*Pens of Three Southdown Ewe Lambs, dropped in* 1898. [14 entries, 5 absent.]

1917 **I.** (£10.)—PAGHAM HARBOUR Co., Selsey, Chichester, born Feb. 1–15.

1918 **II.** (£5.)—WILLIAM TOOP, Aldingbourne, Chichester, born Feb. 21.

1906 **R. N. & H. C.**—C. R. W. ADEANE. 1913 **H. C.**—THE EARL OF ELLESMERE. **Com.**—C. R. W. ADEANE, for No. 1907; EARL CADOGAN, K G, for No. 1910; J. J. COLMAN, for No. 1911; E. MATHEWS, for No. 1914; T. MILES, for No. 1915.

Hampshire Downs.

Class 183.—*Hampshire Down Two-Shear Rams.* [5 entries, 1 absent.]

1920 **I.** (£10.)—A. DE MORNAY, Col d'Arbres, Wallingford, for **Col d'Arbres No. 3**, born Jan. 16; *s.* Col d'Arbres No. 2 1949.

1922 **II.** (£5.)—LORD ROTHSCHILD, Tring Park, Herts; born about Jan. 10.

1921 **R. N. & H. C.**—JAMES FLOWER, Chilmark, Salisbury.

1923 **H. C.**—W. T. TWIDELL, for **Twidell's XXVI.**

Class 184.—*Hampshire Down Shearling Rams.* [17 entries, 7 absent.]

1930 **I.** (£15.)—A. DE MORNAY, Col d'Arbres, Wallingford, for **Col d'Arbres No. 8**, born Jan. 16; *s.* Col d'Arbres No. 2 1949.

1927 **II.** (£10.)—THE EARL OF CARNARVON, Highclere Castle, Newbury, born about Feb. 1.

1934 **III.** (£5.), & 1935 **R. N. & H. C.**—LORD ROTHSCHILD, Tring Park, Herts, born about Jan. 10.

Class 185.—*Pens of Three Hampshire Down Ram Lambs, dropped in* 1898. [18 entries, 3 absent.]

1949 **I.** (£10.)—JAMES FLOWER, Chilmark, Salisbury, born about Jan. 10.

1947 **II.** (£5.)—THE EARL OF CARNARVON, Highclere Castle, Newbury, born about Jan. 14.

1952 **R. N. & H. C.**—THOMAS PALMER, Berry Court, Stockbridge. **H. C.**—L. H. BAXENDALE, for No. 1941; W. T. TWIDELL, for No. 1956; E. WHALLEY-TOOKER, for No. 1957.

1953 **Com.**—LORD ROTHSCHILD.

Class 186.—*Pens of Three Hampshire Down Shearling Ewes, of the same Flock.* [4 entries, none absent.]

1959 **I.** (£15.)—A. DE MORNAY, Col d'Arbres, Wallingford, born Jan. 14.

1962 **II.** (£10.)—W. T. TWIDELL, Mays Farm, Crowmarsh, Wallingford, born about Jan. 14.

1960 **R. N.**—W. B. GREENFIELD.

Class 187.—*Pens of Three Hampshire Down Ewe Lambs, dropped in* 1898. [15 entries, 3 absent.]

1967 **I.** (£10.)—THE EARL OF CARNARVON, Highclere Castle, Newbury, born about Jan. 14.

1972 **II.** (£5.)—T. PALMER, Berry Court, Lower Wallop, Stockbridge, born Jan.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

1966 **R. N. & H. C.**—T. FOWELL BUXTON, Waters Place, Ware.

H. C.—J. FLOWER, for No. 1970; LORD ROTHSCHILD, for No. 1973; E. WHALLEY-TOOKER, for No. 1977.

Com.—L. H. BAXENDALE, for No. 1963; A. DE MORNAY, for No. 1969.

Suffolks.

Class 188.—*Suffolk Two-Shear Rams.* [2 entries.]

1978 **I.** (£10.), & 1979 **II.** (£5.)—THE EARL OF ELLESMERE, Stetchworth Park, Newmarket, born Feb.

Class 189.—*Suffolk Shearling Rams.* [4 entries, none absent.]

1981 **I.** (£15, & **Champion**[1]) & 1982 **II.** (£10, & **R. N. for Champion.**[1])—THE EARL OF ELLESMERE, Stetchworth Park, Newmarket, born Feb.

1980 **R. N. & Com.**—A. H. COBBALD, for **Akenham Marine.**

Class 190.—*Pens of Three Suffolk Ram Lambs, dropped in* 1898. [3 entries.]

1984 **I.** (£10.)—THE EARL OF ELLESMERE, Stetchworth Park, Newmarket, born Feb.

1985 **II.** (£5.), & 1986 **R. N. & H. C.**—S. R. SHERWOOD, Playford, Ipswich, born Feb.

Class 191.—*Pen of Three Suffolk Shearling Ewes, of the same Flock.* [2 entries.]

1987 **I.** (£15.), & 1988 **R. N. & H. C.**—THE EARL OF ELLESMERE, Stetchworth Park, Newmarket, born Feb.

Class 192.—*Pen of Three Suffolk Ewe Lambs, dropped in* 1898. [2 entries, none absent.]

1990 **I.** (£10.)—S. R. SHERWOOD, Playford, Ipswich, born Feb.

Border Leicesters.

Class 193.—*Border Leicester Two-Shear Rams.* [10 entries, 1 absent.]

1997 **I.** (£10.)—ROBERT TAYLOR, Pitlivie, Carnoustie, N.B., born Mar. 15, bred by Robert Wallace, Auchindrain, Mauchline, Ayrshire.

1994 **II.** (£5.)—J. W. HALL, Mayo Street, Cockermouth, for Tom, born Mar. 15, bred by John Mark, Sunnyside, Prestonkirk, N.B.; *s.* Son of the Century.

1991 **R. N. & H. C.**—THE RIGHT HON. A. J. BALFOUR, M.P.

2000 **Com.**—T. WINTER.

Class 194.—*Border Leicester Shearling Rams.* [14 entries, none absent.]

2010 **I.** (£15.) & 2012 **II.** (£10.)—JOHN TWENTYMAN, Hawkrigg House, Wigton, born Mar.

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[1] Gold Medal given by the Suffolk Sheep Society for the best Suffolk Ram in Classes 188–189.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

2001 **III.** (£5.)—THE RIGHT HON. A. J. BALFOUR, M.P., Whittinghame, Prestonkirk, N.B., born Mar.

2006 **R. N. & H. C.**—GEORGE LAING, New Etal, Cornhill-on-Tweed.
Com.—J. E. NICHOLSON, for No. 2009; T. WINTER, for Nos. 2013 and 2014.

Class 195.—*Pens of Three Border Leicester Ram Lambs, dropped in* 1898. [2 entries.]

2015 **I.** (£10)—GEORGE LAING, New Etal, Cornhill-on-Tweed, born Mar.
2016 **II.** (£5.)—J. TWENTYMAN, Hawkrigg Ho., Wigton, born Mar. 1, 19 & 20.

Class 196.—*Pens of Three Border Leicester Shearling Ewes, of the same Flock.* [7 entries, none absent.]

2018 **I.** (£15.)—J. W. HALL, Mayo Street, Cockermouth, born Mar. 28 & Apr. 2; *ss.* Hawkrigg Royal & Baillie Knowe Bred Ram, *ds. by* Young Hornfall.

2017 **II.** (£10.)—THE RIGHT HON. A. J. BALFOUR, M.P., Whittinghame, Prestonkirk, N.B., born Mar.

2023 **III.** (£5.)—THOMAS WINTER, Springfield House, Sherburn, born Mar.
2021 **R. N. & H. C.**—J. E. NICHOLSON. 2020 **Com.**—GEORGE LAING.

Class 197.—*Pens of Three Border Leicester Ewe Lambs dropped in* 1898. [3 entries, none absent.]

2024 **I.** (£10.)—GEORGE LAING, New Etal, Cornhill-on-Tweed, born Mar.
2025 **II.** (£5.)—J. TWENTYMAN, Hawkrigg Ho., Wigton, born Mar. 11, 17 & 21.

Somerset and Dorset Horned.

Class 198.—*Somerset and Dorset Horned Shearling Rams, dropped after November* 1, 1896. [3 entries.]

2028 **I.** (£10.)—W. R. FLOWER, West Stafford, Dorchester, for **Flower's No. 54,** born Nov. 30; *s.* Flower's No. 41 678.
2029 **II.** (£5.)—HARRY MCCALMONT, M.P., Bishopswood, Ross, born Nov. 24.
2027 **R. N.**—W. R. FLOWER, for **Flower's No. 53.**

Class 199.—*Pens of Three Somerset and Dorset Horned Shearling Ewes, of the same Flock, dropped after November* 1, 1896. [3 entries.]

2032 **I.** (£10.)—HARRY MCCALMONT, M.P., Bishopswood, Ross, born Nov., bred by Walter Paul, Ilchester.

2030 **II.** (£5.)—W. R FLOWER, West Stafford, Dorchester, born Nov. 30; *s.* Flower's No. 45 682.

2031 **R. N. & H. C.**—HARRY MCCALMONT, M P.

Kentish or Romney Marsh.

Class 200.—*Kentish or Romney Marsh Shearling Rams.* [16 entries, 1 absent.]

2040 **I.** (£10.) & 2039 **II.** (£5.)—WILLIAM MILLEN, Syndale Valley, Faversham, born Mar.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

2037 **R. N. & H. C.**—J. S. S. GODWIN, Hadlow, Tonbridge, for **Hazlewood 2nd.**
2034 **H. C.**—G. W. FINN. 2036 **Com.**—J. S. S. GODWIN, for **Hazlewood 1st.**

Class 201.—*Pens of Three Kentish or Romney Marsh Shearling Ewes, of the same Flock.* [11 entries, 1 absent.]

2054 **I.** (£10.)—F. NEAME, Macknade, Faversham, born about Mar. 12.
2058 **II.** (£5.)—HENRY RIGDEN, Lyminge, Hythe, Kent, born Apr.
2051 **R. N. & H. C.**—WILLIAM MILLEN, Syndale Valley, Faversham.
2053 **H. C.**—F. NEAME. 2059 **Com.**—H. RIGDEN

Wensleydales.

Class 202.—*Wensleydale Two-Shear or Shearling Rams.* [10 entries, 4 absent.]

2069 **I.** (£10.)—EXORS. OF LATE T. WILLIS, Carperby, Aysgarth, born Mar. 1897; *s.* Royal Darlington 351, *d. by* William Rufus 237.

2066 **II.** (£5.)—J. RHODES, Stockeld, Wetherby, born Mar. 5, 1897; *s.* Stockeld 2nd 590.

2061 **R. N. & H. C.**—J. H. CALVERT, Sunnyside, Masham, Yorks.
2068 **H. C.**—EXORS. OF LATE T. WILLIS. 2067 **Com.**—J. RHODES.

Class 203.—*Pens of Three Wensleydale Shearling Ewes, of the same Flock.* [8 entries, 1 absent.]

2074 **I.** (£10.)—JOHN HEUGH, Mudd Fields, Bedale, born about Mar. 10; *s.* Tribesman, *d. by* Eton.

2077 **II.** (£5.)—EXORS. OF LATE T. WILLIS, Carperby, Aysgarth, born Mar. 16 and Apr 5 and 8; *ss.* Blood Royal 371 and Caractacus 374, *ds. by* Lord of the Valley 109 and Heir of the Valley 259.

2071 **R. N. & H. C.**—G. R. ETHERINGTON. 2076 **H. C.**—J. RHODES.

Cheviots.

Class 204.—*Cheviot Two-Shear or Shearling Rams.* [4 entries, none absent.]

2078 **I.** (£10.)—JACOB ROBSON, Byrness, Otterburn, born Apr., 1896.
2080 **II.** (£5.)—JOHN ROBSON, Newton, Bellingham, born Apr., 1896.
2081 **R. N.**—JOHN ROBSON, born Apr. 1897.

Class 205.—*Pens of Three Cheviot Shearling Ewes, of the same Flock.* [4 entries, none absent.]

2084 **I.** (£10.)—JOHN ROBSON, Newton, Bellingham, born Apr.
2082 **II.** (£5.) & 2083 **R. N. & Com.**—JACOB ROBSON, Byrness, Otterburn, born Apr.

Black-Faced Mountain.

Class 206.—*Black-Faced Mountain Two-Shear or Shearling Rams.* [8 entries, none absent.]

2087 **I.** (£10.)—T. DARGUE, Burneside Hall, Kendal, born Apr 4, 1897.
2091 **II.** (£5.)—JOHN ROBSON, Newton, Bellingham, born Apr, 1896.
2090 **R. N. & H. C.**—TOM IRVING, for **Avondale.**
2093 **H. C.**—JOSEPH VICKERS, for **Heatherbell.**

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 207.—*Pens of Three Black-Faced Mountain Shearling Ewes, of the same Flock.* [4 entries, none absent.]

2097 I. (£10.)—JOSEPH VICKERS, Elm Park, Tow Law, born Apr.
2094 II. (£5.)—THOMAS DARGUE, Burneside Hall, Kendal.
2095 R. N. & H. C.—TOM IRVING.

Lonks.

Class 208.—*Lonk Two-Year-Old or Yearling Rams.* [4 entries, 1 absent.]

2101 I. (£10.)—WALTON BROS., Horncliffe Stone Quarries, Rawtenstall, born Mar., 1896.

2100 II (£5.)—WALTON BROS., born Mar., 1897, bred by J. Blackburn, Colne, Lancs.

2099 R. N. & H. C.—PARKER & SANDERSON, Whitworth, Lancs.

Class 209.—*Pen of Three Lonk Yearling Ewes, of the same Flock.* [2 entries.]

2102 I. (£10.) & 2103 II. (£5.)—WALTON BROS., Horncliffe Stone Quarries, Rawtenstall, born Mar., bred by Exhibitors and J. Blackburne, Colne.

Herdwicks.

Class 210.—*Herdwick Two-Year-Old or Yearling Rams.* [3 entries.]

2104 I. (£10.)—WILLIAM ABBOTT, Hartsop Hall, Patterdale, Penrith, for **Hartsop Model**, born Apr. 16, 1896.

2105 II. (£5.) & 2106 R. N. & H. C.—HENRY C. HOWARD, Greystoke Castle, Penrith, born Apr. 15, 1897.

Class 211.—*Pens of Three Herdwick Yearling Ewes, of the same Flock.* [3 entries.]

2108 I. (£10.)—H. C. HOWARD, Greystoke Castle, Penrith, born Apr. 15.

2107 II (£5.)—WILLIAM ABBOTT, Hartsop Hall, Patterdale, Penrith, born Apr 2, 4, and 5, bred by Exhibitor and W. Batey, Cockermouth.

2109 R N. & H. C.—W. MACKERETH, Green Bank, Ambleside.

Welsh Mountain.

Class 212.—*Welsh Mountain Two-Shear or Shearling Rams.* [9 entries, none absent.]

2112 I. (£10.)—J. MARSHALL DUGDALE, Llwyn, Llanfyllin, Mont., for **Taffy 2nd**, born 1896.
2118 II. (£5.)—W. E. WILLIAMS, Gwerclas, Corwen, for **Twrn-Shon-Dafydd**, born Apr. 15, 1897; *s.* Dafydd, *d.* Shan *by* Twin-y-Nant.

2114 R. N. & H. C. & 2115 H. C.—COL. HENRY PLATT.
2113 Com.—J. MARSHALL DUGDALE.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 213.—*Pens of Three Welsh Mountain Shearling Ewes, of the same Flock.* [7 entries, none absent.]

2123 **I.** (£10.) & 2124 **II.** (£5.)—COLONEL HENRY PLATT, Gorddinog, Llanfairfechan, born Mar. 20; *s.* Taffy, *d. by* Llwydmor.

2122 **R. N. & H. C.**—J. MARSHALL DUGDALE, Llwyn, Llanfyllin.
2125 **H. C.**—W. E. WILLIAMS. 2121 **Com.**—J. MARSHALL DUGDALE.

PIGS.

Large White Breed.

Class 214.—*Large White Boars, farrowed in* 1896 *or* 1897. [10 entries, 2 absent.]

2132 **I.** (£10, & **Champion.**[1])—PHILO L. MILLS, Ruddington Hall, Notts, for **Ruddington Lad** 4393, born Feb. 5, 1896; *s.* Ruddington King David VIII. 4031, *d.* Borrowfield Duchess XVI. 5012 *by* Borrowfield Ringleader.

2129 **II.** (£5., & **R. N. for Champion.**[1])—DENSTON GIBSON, The Fields, Harbury, Leamington, for **Duke of Lancaster III.** 4321, born Jan. 18, 1896, bred by Philip Ascroft, Rufford, Ormskirk; *s.* Duke of Lancaster 1267, *d.* Hope 3rd 5852 *by* Gamester 5th 3049.

2127 **III.** (£3.)—FRANK ALLMAND, Victoria Mills, Wrexham, for **Wrexham Major**, born Jan. 8, 1897; *s.* Wrexham Sol 4117, *d.* Wrexham Juno 6846.

2130 **R. N. & Com.**—DENSTON GIBSON, for **Long Sam 2nd.**
2131 **Com.**—SIR GILBERT GREENALL, BT., for **Walton Luck's All.**

Class 215.—*Pens of Three Large White Boar Pigs, farrowed in* 1898. [17 entries, 2 absent.]

2138 **I.** (£10.)—D. R. DAYBELL, Bottesford, Nottingham, born Jan. 12; *s.* Bottesford Rufford 3903, *d.* Bottesford Queen 7240 *by* Borrowfield Ringleader 2631.

2139 **II.** (£5.)—D. R. DAYBELL, born Jan. 12; *s.* Bottesford Rufford 3903, *d.* Bottesford Queen 7240 *by* Borrowfield Ringleader 2631.

2147 **III.** (£3.)—PHILO L. MILLS, Ruddington Hall, Notts, born Feb. 8; *s.* Ruddington King David VIII. 4031, *d.* Borrowfield Duchess XVI. 5012 *by* Borrowfield Ringleader 2631.

2146 **R. N. & H. C.**—PHILO L. MILLS.
H. C.—REV. T. J. DAVIES, for No. 2137; C. ECOB, for No. 2141.
2140 **Com.**—THOMAS DIGGLE.

Class 216.—*Large White Breeding Sows, farrowed before or in* 1897. [15 entries, 2 absent.]

2163 **I.** (£10).[2]—PHILO L. MILLS, for **Miss Hollingsworth LIV.** 7444, born Sept. 6, 1895 [farrowed Aug. 19, 1898]; *s.* Ruddington King David V. 3143, *d.* Miss Hollingsworth XXXIX. 5236 *by* Borrowfield Rover 1709.

2162 **II.** (£5.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Walton Sunflower** 6792, born Feb. 5, 1895 [farrowed July 28, 1898]; *s.* Walton Captain 3171, *d.* Sunbeam VIII. 4756 *by* Ben III. 927.

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[1] Gold Medal given by the National Pig Breeders' Association for the best Large White Boar or Sow in Classes 214 and 216.

[2] Nos. 2163, 2162, 2167, 2195, 2219, 2218, have succeeded to their present positions by the disqualification, through non-compliance with the Regulation as to farrowing before 1st September, of the following animals: No. 216[illegible] (First Prize in Class 216), No. 2199 (Third Prize in Class 220), and No. [illegible] (Second Prize in Class 224).

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

2167 III. (£3.)—SANDERS SPENCER, Holywell Manor, St. Ives, Hunts, for **Holywell Model**, born Jan. 17, 1898 [farrowed Aug. 23, 1898]; *s.* Holywell Plymouth 1829, *d.* Holywell Waxwork 2352 *by* Holywell King 509.

H. C.—FRANK ALLMAND, for No. 2153, **Wrexham Belle**, and No. 2154, **Wrexham Bessie II.**; SIR GILBERT GREENALL, BT., for No. 2160, **Princess May**; THE EARL OF ROSEBERY, K.G., for No. 2165, **Dalmeny Empress XI.** and No. 2166, **Joan of Arc III.**

2157 Com.—THE REV. T. J. DAVIES, for **Ratcliffe Gainsborough.**

Class 217.—*Pens of Three Large White Sow Pigs, farrowed in* 1898. [12 entries, 2 absent.]

2169 I. (£10.)—THE REV. T. J. DAVIES, Ratcliffe College, Leicester, born Jan. 7; *s.* Fosse Ranger 3941, *d.* Ratcliffe Duchess II. 6726 *by* Borrowfield Windsor 3435.

2170 II. (£5.)—D. R. DAYBELL, Bottesford, Nottingham, born Jan. 12; *s.* Bottesford Rufford 3903, *d.* Bottesford Queen 7240 *by* Borrowfield Ringleader 2631.

2176 III. (£3.)—PHILO L. MILLS, Ruddington Hall, Notts, born Feb. 8; *s.* Ruddington King David VIII. 4031, *d.* Borrowfield Duchess XVI. 5012 *by* Borrowfield Ringleader 2631.

2177 R. N. & H. C.—H. H OUTRAM. 2171 H C—THOMAS DIGGLE.
Com.—DENSTON GIBSON, for No. 2174; SANDERS SPENCER, for No. 2178.

Middle White Breed.

Class 218.—*Middle White Boars, farrowed in* 1896 *or* 1897. [4 entries, 1 absent]

2183 I. (£10, & Champion.[1])—A. C. TWENTYMAN, Castlecroft, Wolverhampton, for **Castlecroft Royal Emperor**, born Jan. 3, 1897; *s.* Morden Pure Gold 3253, *d.* Castlecroft Daffodil 6871 *by* Castlecroft Robin Hood 3651.

2182 II. (£5.)—SANDERS SPENCER, Holywell Manor, St. Ives, for **Holywell Rosy Boy**, born Apr. 28, 1897; *s* Holywell Count 3239, *d.* Holywell Moss Rose *by* Holywell Baron II. 2869.

Class 219.—*Pens of Three Middle White Boar Pigs, farrowed in* 1898. [8 entries, 4 absent.]

2187 I. (£10.)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, born Jan 20; *s.* Walton Victor 4501, *d* Mayflower III. 6128 *by* Badger 2815.

2191 II. (£5)—A. C. TWENTYMAN, Castlecroft, Wolverhampton, born Jan. 22 & 25; *ss.* Holywell 4165 and Castlecroft Robin Hood 3651, *ds.* Castlecroft Daffodil 6871 *by* Castlecroft Robin Hood 3651, and Castlecroft Lady Leicester 7590 *by* Morden Pure Gold 3253

2188 III. (£3)—ARTHUR HISCOCK, JUN, Manor Farm, Motcombe, Shaftesbury, born Jan. 9; *s.* Turk, *d.* Sweet Lassie *by* Middleman.

Class 220.—*Middle White Breeding Sows, farrowed before or in* 1897. [12 entries, 2 absent.]

2197 I. (£10, & R. N. for Champion.[1])—SANDERS SPENCER, Holywell Manor, St. Ives, for **Holywell Houri**, born Feb 7, 1897 [farrowed Aug. 21, 1898]; *s.* Holywell Stumpy Tail 4179, *d.* Holywell Sultana *by* Holywell Fez 3671.

[1] Gold Medal given by the National Pig Breeders' Association for the best Middle White Boar or Sow in Classes 218 and 220.

[Unless otherwise stated each prize animal named below was "bred by exhibitor."]

2198 **II.** (**£5.**)—SANDERS SPENCER, for **Holywell Hoyden**, born Feb. 7, 1897 [farrowed July 21, 1898]; *s.* Holywell Stumpy Tail 4479, *d.* Holywell Sultana *by* Holywell Fez 3671.

2195 **III.** (**£3.**[1])—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Walton Daisy II.** 7642, born June 5, 1896 [farrowed Aug. 20, 1898]; *s.* Walton Major 3695, *d.* Walton Daisy *by* Prince of Worsley 1527.

H. C.—A. C. TWENTYMAN, for No. 2202, **Castlecroft Daisy Bell**, and No. 2203, **Castlecroft Rose II.**

2196 **Com.**—SIR GILBERT GREENALL, BT., for **Walton Rose.**

Class 221.—*Pens of Three Middle White Sow Pigs, farrowed in* 1898. [7 entries, 1 absent.]

2209 **I.** (**£10.**)—ARTHUR HISCOCK, JUN., Manor Farm, Motcombe, Shaftesbury, born Jan. 2; *s.* Turk, *d* Kate *by* Middleman.

2207 **II.** (**£5.**)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, born Jan. 20; *s.* Walton Victor 4501, *d.* May Flower III. 6128 *by* Badger 2845.

2210 **III.** (**£3.**)—A. C. TWENTYMAN, Castlecroft, Wolverhampton, born Jan. 22 & 25; *ss.* Castlecroft Robin Hood 3651 & Holywell 4465, *ds.* Castlecroft Lady Leicester 7590 *by* Morden Pure Gold 3253, & Castlecroft Daffodil 6874 *by* Castlecroft Robin Hood 3651.

2208 **R. N. & H. C.**—SIR GILBERT GREENALL, BT.

Small White Breed.

Class 222.—*Small White Boars, farrowed in* 1896 *or* 1897. [5 entries, 1 absent.]

2212 **I.** (**£10, & R. N. for Champion.**[2])—THE HON. D. P. BOUVERIE, Coleshill House, Highworth, born Jan. 2, 1897; *s.* Coleshill Dick 4505, *d.* Coleshill Princess 6942.

2214 **II.** (**£5.**)—SIR GILBERT GREENALL, BT., Walton Hall, Warrington, for **Walton Peacock**, born Feb. 12, 1897; *s.* Temple Champion 4179, *d.* Walton Tiny 7706 *by* Prescot 2897.

2211 **R. N. & H. C.**—THE HON. D. P. BOUVERIE, for **Coleshill Enterprise.**

Class 223.—*Pen of Three Small White Boar Pigs, farrowed in* 1898. [1 entry.]

2216 **I.** (**£10.**)—THE HON. D. P. BOUVERIE, Coleshill House, Highworth, born Jan. 1; *s.* Coleshill Edward 4509, *d.* Coleshill Empress 5444.

Class 224.—*Small White Breeding Sows, farrowed before or in* 1897. [7 entries, none absent.]

2220 **I.** (**£10, & Champion.**[2])—DENSTON GIBSON, The Fields, Harbury, Leamington, for **Metchley Fairy** 7694, born Jan. 18, 1896 [farrowed Aug. 7, 1898]; *s.* Metchley Tom Thumb 3273, *d.* Metchley Royal 5466 *by* Prescot Toy 2099.

2219 **II.** (**£5.**[1])—DENSTON GIBSON, for **Metchley Dot** 7690, born July 20, 1896 [farrowed Aug. 24, 1898]; *s.* Metchley Tom Thumb 3273, *d.* Metchley Toy 5468 *by* Prescot Toy 2475.

2218 **III.** (**£3.**)—THE HON. D. P. BOUVERIE, Coleshill, Highworth, born Jan. 2, 1897 [farrowed Aug. 19, 1898]; *s.* Coleshill Dick 4505, *d.* Coleshill Princess 6942.

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[1] See footnote on p. cli.

[2] Gold Medal given by the National Pig Breeders' Association for the best Small White Boar or Sow in Classes 222 and 224.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 225.—*Pens of Three Small White Sow Pigs, farrowed in* 1898. [3 entries.]

2225 I. (£10) & 2224 II. (£5)—THE HON. D. P. BOUVERIE, Coleshill House, Highworth, born Jan. 1; *s.* Coleshill Edward 1509, *d.* Coleshill Empress 5111.

2226 R. N. & H. C.—ARTHUR HISCOCK, JUN.

Berkshire Breed.

Class 226.—*Berkshire Boars, farrowed in* 1896 *or* 1897. [9 entries, 3 absent.]

2232 I. (£10. & R. N. for Champion.[1])—JOHN JEFFERSON, Peel Hall, Chester, for **Peel Swansea**, born May 7, 1896; bred by E. Burbidge, South Wraxhall; *d.* Stillroom Maid 5717 *by* Halle 3626.

2233 II. (£5.)—JOHN JEFFERSON, for **Peel Victor** 5878, born Jan. 5, 1896, bred by J. A. Caird, Micheldever; *s.* Dr. Jameson 5513, *d.* Cat's Eye 5234 *by* Waterloo 4130.

2234 III. (£3.)—J. PITTMAN KING, North Stoke, Wallingford, born Aug. 7, 1896; *s.* Dr. Jameson 5513, *d.* Thistlebank 4647 *by* Highlander 3010.

2227 R. N. & H. C.—T. H. ATKINS, for **Zola**.
2235 H. C.—JAMES LAWRENCE, for **Lord Harris**.
2228 Com.—N. BENJAFIELD, for **Ace of Trumps**.

Class 227.—*Pens of Three Berkshire Boar Pigs, farrowed in* 1898. [10 entries, 3 absent.]

2243 I. (£10.)—RUSSELL SWANWICK, R.A.C. Farm, Cirencester, born Jan 2; *s.* Loyal Bucks, *d.* Stumpy 1327 *by* Andover C. 5562.

2239 II. (£5.)—JAMES W. KIMBER, Fyfield Wick, Abingdon, born Jan. 6, 12, 16; *ss.* Sambo CCCCXXVI. 4206, Masonic 5215 and Supreme Duke 5537, *ds.* Mimic II. 4823 *by* Windsor's Supreme 2811, Vittoria II. 5970 *by* Supreme Duke 5537, Simple Mary 1829 *by* Sherfield Marquis 1049.

2238 III. (£3.)—JOHN JEFFERSON, Peel Hall, Chester, born Jan. 1; *s.* Peel Surprise 5881, *d.* Peel Kitty *by* Walton Turk 1712.

2242 R. N. & H. C.—PHILIP L. MILLS.

Class 228.—*Berkshire Breeding Sows, farrowed before or in* 1897. [21 entries, 6 absent.]

2251 I. (£10, & Champion.[1])—THE EARL OF CARNARVON, Highclere Castle, Newbury, born May 7, 1896 [farrowed Aug. 4, 1898], bred by E. Burbidge, South Wraxhall, Bradford-on-Avon; *s.* Swansea 3751, *d.* Stillroom Maid 5717 *by* Halle.

2259 II. (£5.)—J. PITTMAN KING, North Stoke, Wallingford, for **Lady Oxford II.**, born Jan. 16, 1896 [farrowed July 24, 1898]; *s.* First Lord 4341, *d.* Lady Oxford 4707 *by* Athelhampton 2574.

2255 III. (£3.)—JOHN JEFFERSON, Peel Hall, Chester, for **Peel Flirtation** 5874, born Aug. 26, 1895 [farrowed Aug. 1, 1898], bred by E. Burbidge, South Wraxhall; *s.* Halle 3626, *d.* Flirtation 4029 *by* Ransome 2675.

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[1] Prize, value £5, given by the British Berkshire Society for the best Berkshire Boar or Sow in Classes 226 and 228.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

2254 **R. N. & H. C.**—R. W. HUDSON, for **Danesfield Poem.**
H. C.—T. H. ATKINS, for No. 2247, **Flora's Choice**; JOHN JEFFERSON, for No. 2256, **Peel Queen.**
Com.—PHILO L. MILLS, for No. 2263, **Melody XVII.**; RUSSELL SWANWICK, for No. 2264, **Sallie DCCCLXXVI.**; A. O. WORTHINGTON, for No. 2266, **Maple Countess.**

Class 229.—*Pens of Three Berkshire Sow Pigs, farrowed in* 1898. [13 entries, 4 absent.]

2277 **I.** (£10.)—RUSSELL SWANWICK, R.A.C. Farm, Cirencester, born Jan. 3; *s.* Loyal Bucks, *d.* Stumpy 1427 *by* Andover C 5562.

2276 **II.** (£5.)—PHILO L. MILLS, Ruddington Hall, Notts, born Jan. 6 and Feb. 1; *s.* Cavalier 5837, *ds.* Ruddington Pattie 5019 *by* Cavendish 3701, and Tranquil III. 5454 *by* Darnley 4627.

2268 **III.** (£3.)—NATHANIEL BENJAFIELD, Shorts Green Farm, Motcombe, Shaftesbury, born Jan. 2; *s.* Letcombe Lord 5423, *d.* Highclere Beatrice 6030 *by* Master Ham 6079.

2271 **R. N. & H. C.**—JOHN JEFFERSON, Peel Hall, Chester.
2273 **H. C.**—J. W. KIMBER, Fyfield Wick, Abingdon.
Com.—T. H. ATKINS, for No. 2267; J. LAWRENCE, for No. 2275.

Tamworth Breed.

Class 230.—*Tamworth Boars, farrowed in* 1896 *or* 1897. [10 entries, none absent.]

2288 **I.** (£10, & **R. N. for Champion.**[1])—D. W. PHILIP, Whitacre, Birmingham, for **Whitacre Coral**, born Aug. 24, 1897, bred by J. Pearman, Bodymoor Farm, Kingsbury, Tamworth; *s.* Cliff Crystal, *d.* Castle Bromwich Present 6256 *by* Knowle Marquis 3329.

2287 **II.** (£5.)—D. W. PHILIP, for **Whitacre Crystal**, born Aug. 24, 1897, bred by J. Pearman, Kingsbury; *s.* Cliff Crystal, *d.* Castle Bromwich Present 6256 *by* Knowle Marquis 3329.

2283 **III.** (£3.)—ROBERT IBBOTSON, Knowle, Warwickshire, for **Knowle King**, born Jan. 10, 1897; *s.* Warwickshire Monarch 4597, *d.* Warwickshire Lady 6434 *by* Whitacre Goldfinder 2973.

2286 **R. N. & H. C.**—J. & J. NORMAN, Cliff House, Tamworth.
2280 **H. C.**—EGBERT DE HAMEL, for **Middleton Matchless.**

Class 231.—*Pens of Three Tamworth Boar Pigs, farrowed in* 1898. [8 entries, none absent.]

2293 **I.** (£10.)—ROBERT IBBOTSON, Knowle, Warwickshire, born Jan. 2; *s.* Knowle King, *d.* Knowle Pansy 7764 *by* Knowle Monarch 3781.

2296 **II.** (£5.)—D. W. PHILIP, Whitacre, Birmingham, born Jan. 13; *s.* Cliff Crystal, *d.* Whitacre Favourite 7830 *by* Knowle Rector 3783.

2295 **III.** (£3.)—JOHN NORMAN, Cliff House, Tamworth, born Jan. 16; *s.* Cliff Cupid, *d.* Cliff Confidence *by* Holt Commander 3771.

2292 **R. N.**—MRS. E. IBBOTSON, Gun Hill, Arley, Coventry.

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[1] Gold Medal given by the National Pig Breeders' Association and Silver Cup, value £10 10*s.*, given by the Birmingham Local Committee for the best Tamworth Boar or Sow exhibited in Classes 230, 232 and 233.

[Unless otherwise stated, each prize animal named below was "bred by exhibitor."]

Class 232.—*Tamworth Breeding Sows, farrowed before or in* 1897. [11 entries, 1 absent.]

2302 **I. (£10, & Champion.[1])**—JOHN NORMAN, Cliff House, Tamworth, for **Cliff Crocodile** 7722, born Dec. 15, 1895 [farrowed Aug. 6, 1898], bred by T. Clayton, Castle Bromwich, Birmingham; *s.* Knowle Rector 3783, *d.* Castle Bromwich Maude 4236 *by* Goldfinch 2505.

2300 **II. (£5.)**—ROBERT IBBOTSON, Knowle, Warwickshire, for **Knowle Gem** 7760, born Jan. 7, 1896 [farrowed July 5, 1898]; *s.* Knowle Monarch 3781, *d.* Knowle Confidence 6328 *by* Knowle Duke 3321.

2304 **III. (£3.)**—D. W. PHILIP, Whitacre, Birmingham, for **Whitacre Favourite** 7830, born Feb. 20, 1896 [farrowed July 21, 1898], bred by T. Clayton, Park Hall, Castle Bromwich, Birmingham; *s.* Knowle Rector 3783, *d.* Castle Bromwich Belle 6218 *by* Duke of Westminster 2919.

2306 **R. N. & H. C.**, & 2307 **H. C.**—THOMAS TOMPSON.
Com.—ROBERT IBBOTSON, for No. 2299, **Warwickshire Lady**; THE REV. R. S. MITCHISON, for No. 2301, **Barby Queen**; THOMAS TOMPSON, for No. 2308.

Class 233.—*Tamworth Breeding Sows, farrowed before or in* 1897, *suckling their litters of pigs.*[2] [5 entries, 3 absent.]

2311 **I. (£10.)**—D. W. PHILIP, Whitacre, Birmingham, for **Grand Duchess** 3744, born Dec. 9, 1889, bred by A. Ibbotson, Gun Hill, Arley, Coventry; *s.* Gun Hill Prince 1591, *d.* Gun Hill Duchess 2814 *by* Curly 633.

2310 **R. N.**—ROBERT IBBOTSON, for **Knowle Mayflower II.**

Class 234.—*Pens of Three Tamworth Sow Pigs, farrowed in* 1898. [10 entries, 2 absent.]

2315 **I. (£10.)**—MRS. E. IBBOTSON, Gun Hill, Arley, Coventry, born Jan. 3; *s.* Knowle King, *d.* Gun Hill Confidence II. 7736 *by* Knowle Monarch 3781.
2316 **II. (£5.)**—ROBERT IBBOTSON, Knowle, Warwickshire, born Jan. 4; *s.* Knowle King, *d.* Knowle Princess May 6336 *by* Knowle Duke 3321.

2317 **III. (£3.)**—ROBERT IBBOTSON, born Jan. 3; *s.* Knowle King, *d.* Knowle Rosy II. 7102 *by* Knowle Monarch 3781.

2319 **R. N. & H. C.**—D. W. PHILIP, Whitacre, Birmingham.
Com.—EGBERT DE HAMEL, for No. 2314; JOHN NORMAN, for No. 2318; THOMAS TOMPSON, for No. 2323.

POULTRY.

By "Cock," "Hen," "Drake," "Duck," "Gander," and "Goose" are meant birds hatched previous to January 1st, 1898; and by "Cockerel," "Pullet," "Young Drake," and "Duckling" are meant birds hatched in 1898, previous to June 1st.

FOWLS.

Dorkings.

Class 235.—*Coloured Dorking Cocks.* [11 entries, none absent.]
2328 **I. (30*s.*)**—JOHN GILLIES, Edington Mills, Chirnside, N.B. 1896.
2333 **II. (15*s.*)**—HERBERT REEVES, Northlands, Emsworth, Hants. 1896.

[1] Gold Medal given by the National Pig Breeders' Association and Silver Cup, value £10 10*s.*, given by the Birmingham Local Committee for the best Tamworth Boar or Sow exhibited in Classes 230, 232 and 233.
[2] Prizes given by the Birmingham Local Committee.

2329 III. (10*s.*)—THOMAS HULSE, Madeley Mills, Newcastle, Staffs.
2327 R. N. & H. C.—R. FITTON, Ribby Hall, Kirkham, Lancs.
H. C.—T. BRIDEN, for No. 2324; S. H. HYDE, for No. 2330; G. W. JONES, for No. 2331; W. J. RUSSELL, for No. 2334.
Com.—R. W. CRESSWELL WARD, for No. 2325; H. MEREDITH, for No. 2332.

Class 236.—*Coloured Dorking Hens.* [12 entries, none absent.]

2346 I. (30*s.*)—HERBERT REEVES, Northlands, Emsworth, Hants. 1896.
2341 II. (15*s.*)—CAPT. G. P. HORNBY, Sandley House, Gillingham. 1896.
2339 III. (10*s.*)—R. FITTON, Ribby Hall, Kirkham, Lancs. 1896.
2340 R. N. & H. C.—JOHN GILLIES, Edington Mills, Chirnside, N.B. 1895.
H. C.—T. BRIDEN, for No. 2336; S. H. HYDE, for No. 2343; C. LUCKIN, for No. 2344.
Com.—C. ECOB, for No. 2338; H. MEREDITH, for No. 2345.

Class 237.—*Coloured Dorking Cockerels.* [9 entries, none absent.]

2353 I. (30*s.*)—CHAS. LUCKIN, Thakenham Place, Pulborough, Sussex, Jan. 8.
2352 II. (15*s.*)—CAPT. G. P. HORNBY, Sandley House, Gillingham. Jan. 2.
2347 III. (10*s.*)—THOMAS BRIDEN, Cononley, Keighley, Yorks. Jan 10.
2350 R. N. & H. C.—R. FITTON, Ribby Hall, Kirkham, Lancs. Jan. 14.
H. C.—J. GILLIES, for No. 2351; H. REEVES, for No. 2354.

Class 238.—*Coloured Dorking Pullets.* [13 entries, 2 absent.]

2365 I. (30*s.*)—S. H. HYDE, Kempton Park, Sunbury-on-Thames. Feb.
2363 II. (15*s.*)—CAPT. G. P. HORNBY, Sandley House, Gillingham. Jan. 2.
2356 III. (10*s.*)—THOMAS BRIDEN, Cononley, Keighley, Yorks. Jan. 10.
2366 R. N. & H. C.—CHARLES LUCKIN, Thakenham Place, Pulborough.
H. C.—T. BROCKLEBANK, for No. 2357; CAPT. HORNBY, for No. 2362; T. HULSE, for No. 2364.
2367 Com.—HERBERT REEVES.

Class 239.—*Silver Grey Dorking Cocks.* [6 entries.]

2371 I. (30*s.*)—R. FITTON, Ribby Hall, Kirkham, Lancs. 1897.
2369 II. (15*s.*)—JAMES BLUNDELL, Weeton, Kirkham, Lancs. 1896.
2374 III. (10*s.*)—HERBERT REEVES, Northlands, Emsworth, Hants. 1897.
2370 R. N. & H. C.—O. E. CRESSWELL, Morney Cross, Hereford.
H. C.—CAPT. HORNBY, for No. 2372; H. MEREDITH, for No. 2373.

Class 240.—*Silver Grey Dorking Hens.* [6 entries.]

2380 I. (30*s.*)—HERBERT REEVES, Northlands, Emsworth, Hants. 1896.
2378 II. (15*s.*)—R. FITTON, Ribby Hall, Kirkham, Lancs. 1896.
2376 III. (10*s.*)—O. E. CRESSWELL, Morney Cross, Hereford.
2375 R. N. & H. C.—JAMES BLUNDELL, Weeton, Kirkham.
2379 H. C.—A. T. & H. PEARS. 2377 Com.—O. E. CRESSWELL.

Class 241.—*Silver Grey Dorking Cockerels.* [4 entries.]

2383 I. (30*s.*)—CAPT. G. P. HORNBY, Sandley House, Gillingham. Jan. 2.
2384 II. (15*s.*)—HERBERT REEVES, Northlands, Emsworth, Hants. Jan. 2.
2382 R. N. & H. C. & 2381 Com.—THE HON. FLORENCE M. T. AMHERST.

Class 242.—*Silver Grey Dorking Pullets.* [9 entries, none absent.]

2393 I. (30*s.*)—HERBERT REEVES, Northlands, Emsworth, Hants. Jan. 2.
2386 II. (15*s.*)—THE HON. FLORENCE AMHERST, Didlington Hall, Brandon. Jan. 6.

2388 III. (10*s.*)—R. FITTON, Ribby Hall, Kirkham, Lancs. Jan. 14.
2392 R. N. & H. C—HERBERT REEVES.
H. C.—THE HON. FLORENCE AMHERST, for No. 2385; CAPT. HORNBY, for No. 2390; T. RAE, for No. 2391.

Class 243.—*White or Cuckoo Dorking Cocks or Cockerels.* [8 entries, 1 absent.]

2397 I. (30*s*) & 2398 III. (10*s*.)—O E. CRESSWELL, Morney Cross, Hereford.
2401 II. (15*s*.)—J. J. G. WOODCOCK, Briston, Melton Constable. 1897.
2396 R. N. & H. C.—MISS BETTON. 2394 Com.—S. W. BENNETT.

Class 244.—*White or Cuckoo Dorking Hens or Pullets.* [7 entries, 1 absent.]

2404 I. (30*s*.) & 2405 II. (15*s*.)—O. E. CRESSWELL, Morney Cross, Hereford.
2408 III. (10*s*.)—J. J. G. WOODCOCK, Briston, Melton Constable. 1897.
2406 R. N. & H. C.—C. BURRELL FULLER, Knowle, Olyst St. George, Exeter.
H. C.—S. W. BENNETT, for Nos. 2402 and 2403.

Game.

Class 245.—*Old English Game Cocks.* [23 entries, 1 absent.]

2420 I. (30*s*.)—W. H. LEWIS, Green Meadow, Maesffrwd, Treorchy, Glam.
2426 II. (15*s*.)—H. JASPER SELWYN, Little Woodcote, Kenilworth.
2429 III. (10*s*.)—N. G. SMETHURST, Station Hotel, Cuddington, Northwich.
2425 R. N. & H. C.—H. JASPER SELWYN.
H. C.—COUNTESS OF CRAVEN, for No. 2413; LAMBERT BROS., for No. 2418; C. W. WILSON, for No. 2431.
Com.—T. S. BATES, for No. 2410; J. P. LAW, for No. 2419; J. WILLS, for No. 2430.

Class 246.—*Old English Game Hens.* [21 entries, 1 absent.]

2452 I. (30*s*.)—C. W. WILSON, The Gale, Abbey Town. Apr. 15, 1895.
2443 II. (15*s*.)—W. H. LEWIS, Green Meadow, Maesffrwd, Treorchy, Glam.
2433 III. (10*s*)—J. W. BROCKBANK, The Croft, Kirksanton. May 25, 1896.
2436 R. N. & H. C.—G. H. FITZHERBERT, Overton House, Hants.
H. C.—J. D. TOOGOOD PARSONS, JUN, for No. 2448; H. JASPER SELWYN, for No. 2449.
Com.—T. GARNER, JUN., for No. 2438; J. L. GLAISTER, for No. 2439; J. W. SIMPSON, for No. 2450.

Class 247.—*Old English Game Cockerels.* [17 entries, 2 absent.]

2467 I. (30*s*.) & 2468 II. (15*s*.)—J. W. SIMPSON, Sun Inn, Bootle, Cumberland. Jan. 6.
2459 III. (10*s*)—THOMAS GARNER, SEN., Abbey Town, Cumberland. Jan. 2.
2458 R. N. & H. C.—G. H. FITZHERBERT, Overton House, Hants.
H. C.—J. ECROYD, for No. 2455; C. W. WILSON, for No. 2469
Com.—J. BELL, for No. 2453; T. GARNER, JUN., for No. 2460.

Class 248.—*Old English Game Pullets.* [18 entries, 1 absent.]

2486 I. (30*s*.)—J. W. SIMPSON, Sun Inn, Bootle, Cumberland. Jan. 8.
2474 II. (15*s*.)—JOHN ECROYD, Alkincoats, Colne, Lancs Jan. 11.
2475 III. (10*s*.)—G. H. FITZHERBERT, Overton House, Hants. Jan. 5.
2481 R. N. & H. C.—J. P. LAW, Croft House, Brampton.
H. C.—LAMBERT BROS, for No. 2479; J. P. LAW, for No. 2480; J. W. SIMPSON, for No. 2485.
2487 Com.—C. W. WILSON.

Class 249.—*Indian Game Cocks.* [10 entries, 1 absent.]

2493 I. (30*s.*)—JAMES FRAYNE, Piper's Pool, Launceston.
2495 II. (15*s.*)—W. E. & E. J. MARSHALL, Pawlett, Bridgwater.
2492 III. (10*s.*)—JOHN FRAYN, St. Stephen's, Launceston.
2496 R. N. & H. C —R. DE O. PEELE, Church House, Ludlow.
2490 H. C.—WILLIAM BRENT.
Com.—ABBOT BROS., for No. 2488; A. H. HAWKEY, for No. 2494.

Class 250.—*Indian Game Hens.* [9 entries, none absent.]

2500 I. (30*s.*)—JOHN FRAYN, St. Stephen's, Launceston.
2498 II. (15*s.*)—ABBOT BROS., Thuxton, Norfolk. 1897.
2501 III. (10*s.*)—JAMES FRAYNE, Piper's Pool, Launceston.
2499 R. N. & H. C.—WILLIAM BRENT, Clampit, Callington.
H. C.—W. E. & E. J. MARSHALL, for No. 2504; W. WATERHOUSE, for No. 2506.

Class 251.—*Indian Game Cockerels.* [14 entries, 1 absent.]

2511 I. (30*s.*)—JOHN FRAYN, St. Stephen's, Launceston. Jan. 4.
2512 II. (15*s.*)—JAMES FRAYNE, Piper's Pool, Launceston. Jan.
2516 III. (10*s.*)—MRS. A. H. STONE, Wembworthy, Devon. Jan. 2.
2508 R. N. & H. C.—WILLIAM BRENT, Clampit, Callington.
H. C.—ABBOT BROS., for No. 2507; J. N. JACKMAN, for No. 2514; R. M. NEVILLE, for No 2515.
2513 Com.—A. H. HAWKEY.

Class 252.—*Indian Game Pullets.* [10 entries, none absent.]

2523 I. (30*s.*)—JOHN FRAYN, St. Stephen's, Launceston. Jan. 4.
2528 II. (15*s.*)—MRS. A. H. STONE, Wembworthy, Devon. Jan. 2.
2524 III. (10*s.*)—JAMES FRAYNE, Piper's Pool, Launceston. Jan.
2521 R. N. & H. C.—ABBOT BROS., Thuxton, Norfolk.
H. C.—J. N. JACKMAN, for No. 2526; J. TAGG, for No. 2530.
Com.—W. BRENT, for No. 2522; A. H. HAWKEY, for No. 2525.

French (Any Varieties).

Class 253.—*French Cocks.* [7 entries, none absent.]

2532 I. (30*s.*)—J. AINSWORTH, High Bank, Darwen. (La Flèche.)
2537 II. (15*s.*)—S. W. THOMAS, Glasfryn, Forest Fach, Swansea. (Houdan.)
2534 III. (10*s.*)—MESDAMES HILL & MACONOCHIE, Tovil House, Maidstone. (Houdan.) 1896.
2531 R. N. & H. C.—ABBOT BROS. (La Flèche.)
2533 H. C.—MESDAMES HILL & MACONOCHIE. (Houdan.)

Class 254.—*French Hens.* [8 entries, 1 absent.]

2544 I. (30*s.*) & 2545 III. (10*s.*)—S. W. THOMAS, Glasfryn, Forest Fach, Swansea. (Houdan.)
2539 II. (15*s.*)—J. AINSWORTH, High Bank, Darwen. (La Flèche.)
2540 R. N. & H. C.—J. HARRISON. (Houdan.)
2542 H. C —MESDAMES HILL & MACONOCHIE. (Houdan.)

Class 255.—*French Cockerels.* [2 entries.]

2547 I. (30*s.*)—S. W. THOMAS, Glasfryn, Forest Fach, Swansea. (Houdan.) Feb. 15.
2546 R. N. & H.C.—MESDAMES HILL & MACONOCHIE. (Houdan.)

Class 256.—*French Pullets.* [2 entries.]

2549 I. (30s.)—S. W. THOMAS, Glasfryn, Forest Fach, Swansea. (Houdan.) Jan. 29.
2548 R. N. & H. C.—MESDAMES HILL & MACONOCHIE. (Houdan.)

Brahmas and Cochins.

Class 257.—*Brahma Cocks.* [9 entries, none absent.]

2551 I. (30s.), 2552 II. (15s.), 2553 III. (10s.)—G. W. HENSHALL, Urmston, Manchester.
2558 R. N. & H. C.—S. W. THOMAS, Glasfryn, Forest Fach, Swansea.
H. C.—J. GILLIES, for No. 2550; R. HOLLAND, for No. 2555.
2556 Com.—JAMES LORD.

Class 258.—*Brahma Hens.* [5 entries.]

2560 I. (30s.)—G. W. HENSHALL, Urmston, Manchester.
2559 II. (15s.)—JOHN GILLIES, Edington Mills, Chirnside, N.B. 1896.
2562 III. (10s.)—R. HOLLAND, Brahma Lodge, Buckingham.
2563 R. N. & H. C.—S. W. THOMAS.
2561 H. C.—THE HIGHGATE MANOR POULTRY FARM.

Class 259.—*Cochin Cocks.* [11 entries, none absent.]

2570 I. (30s.)—G. H. PROCTER, Flass House, Durham. 1896.
2569 II. (15s.)—JOSEPH PARTINGTON, The Woodlands, Lytham. 1 year.
2574 III. (10s.)—ALFRED T. WATTS, Wellingborough.
2572 R. N. & H. C.—H. L. WADE, Oaklands, Knowle, Warwickshire.
2567 H. C.—THE REV. F. S. DODD. 2571 Com.—H. L. WADE.

Class 260.—*Cochin Hens.* [13 entries, 1 absent.]

2584 I. (30s.)—G. H. PROCTER, Flass House, Durham. 1896.
2580 II. (15s.)—THE HELSTON POULTRY YARDS CO., Helston, Cornwall.
2583 III. (10s.)—JOSEPH PARTINGTON, The Woodlands, Lytham. 1 year.
2581 R. N. & H. C.—THE HELSTON POULTRY YARDS CO.
H. C.—H. L. WADE, for Nos. 2585 & 2586.

Class 261.—*Brahma or Cochin Cockerels.* [7 entries, 2 absent.]

2593 I. (30s.)—J. MORRIS, Steeple Claydon, Winslow. (Cochin.) Jan.
2592 II. (15s.)—T. LONGBOTTOM, Moor Edge Ho., Bingley. (Brahma.) Jan. 1
2591 III. (10s.)—R. HOLLAND, Brahma Lodge, Buckingham. (Cochin.) Jan. 3.
2588 R. N. & H. C.—JOHN GILLIES. (Brahma.) Feb. 2.

Class 262.—*Brahma or Cochin Pullets.* [9 entries, 1 absent.]

2601 I. (30s.)—JOSEPH PARTINGTON, Lytham. (Cochin.) 5 months.
2598 II. (15s.)—T. LONGBOTTOM, Moor Edge House, Bingley. (Brahma.)
2595 III. (10s.)—H. BEDFORD, St. James', Brackley. (Brahma.) Jan. 1.
2597 R. N. & H. C.—R. HOLLAND, Brahma Lodge, Buckingham. (Brahma.)
H. C.—J. M. LONGE, for No. 2600. (Brahma.) C. WATSON, for No. 2602. (Cochin.)

Langshans.

Class 263.—*Langshan Cocks.* [15 entries, none absent.]

2609 I. (30s.)—GEORGE FIELDER, 28 Hill Road, Wimbledon. 1897.
2612 II. (15s.)—JONATHAN HILL, Bridgend Mills, Lostwithiel. Feb. 1897.
2604 III. (10s.)—JESSE COE, Rock Lodge, Desborough. 1896.

2611 R. N. & H. C.—The Hon. M. C. Hawke, Wighill Park, Tadcaster.
H. C.—S. Thompson, for No. 2617; R. S. Williamson, for No. 2618.

Class 264.—*Langshan Hens.* [14 entries, none absent.]

2632 I. (30*s.*)—R. S. Williamson, Rawnsley, Hednesford, Staffs.
2625 II. (15*s.*)—George Fielder, 28 Hill Road, Wimbledon. 1897.
2619 III. (10*s.*)—W. Coote Brown, West Haddon, Rugby. 1897.
2631 R. N. & H. C.—J. W. Walker, Upton Lodge, Henley-on-Thames.
H. C.—W. H. Crane, for No. 2621; W. P. Gibb, for No. 2626; G. Mason, for No. 2629.

Class 265.—*Langshan Cockerels.* [6 entries, 1 absent.]

2636 I. (30*s.*)—Miss Dryden, Canon's Ashby, Byfield, Northants. Jan. 26.
2634 II. (15*s.*), and 2633 III. (10*s.*)—C. I. Barnett, Mill End, Henley-on-Thames. Jan. 10.
2638 R. N. & H. C.—J. W. Walker, Upton Lodge, Henley-on-Thames.

Class 266.—*Langshan Pullets.* [4 entries.]

2642 I. (30*s.*)—J. W. Walker, Upton Lodge, Henley-on-Thames. Jan. 4.
2639 II. (15*s.*)—C. J. Barnett, Mill End, Henley-on-Thames. Jan. 10.
2640 R. N. & H. C.—Miss Dryden. 2641 H. C.—W. P. Gibb.

Plymouth Rocks.

Class 267.—*Plymouth Rock Cocks.* [12 entries, 1 absent.]

2651 I. (30*s.*), & 2652 III. (10*s.*)—H. Pinchbeck, Burton-on-Trent. 1896.
2648 II. (15*s.*)—G. & S. Jackson, The Limes, Silverdale, Lancs.
2650 R. N. & H. C.—R. de C. Peele, Church House, Ludlow.
H. C.—A. & S. Donkin, for Nos. 2643 and 2644.

Class 268.—*Plymouth Rock Hens.* [17 entries, 1 absent.]

2664 I. (30*s.*), & 2665 III. (10*s.*)—G. & S. Jackson, The Limes, Silverdale.
2671 II. (15*s.*)—Mrs. Wilkinson, Burrow House, Lancaster.
2659 R. N. & H. C. & H. C. for Nos. 2657 & 2658—A. & S. Donkin.

Class 269.—*Plymouth Rock Cockerels.* [18 entries, 3 absent.]

2688 I. (30*s.*)—Mrs. Wilkinson, Burrow House, Lancaster.
2677 II. (15*s.*)—R. Garlick, Kirkby Lonsdale. Jan. 1.
2678 III. (10*s.*)—John W. Hall, Market Place, Thirsk. Jan. 2.
2682 R. N. & H. C.—G. & S. Jackson, The Limes, Silverdale, Lancs.
H. C.—R. de C. Peele, for No. 2685; Mrs. Wilkinson, for No. 2689.

Class 270.—*Plymouth Rock Pullets.* [19 entries, 2 absent.]

2705 I. (30*s.*), 2706 II. (15*s.*), & 2707 R. N. & H. C.—Mrs. Wilkinson, Burrow House, Lancaster.
2693 III. (10*s.*)—A. & S. Donkin, Four Oaks, Sutton Coldfield. Feb. 15.
H. C.—A. & S. Donkin, for No. 2694; J. W. Hall, for No. 2696; Hallam & Litting, for No. 2697; R. de C. Peele, for No. 2702.

Wyandottes.

Class 271.—*Silver Laced Wyandotte Cocks.* [11 entries, 1 absent.]

2718 I. (30*s.*), & 2717 III. (10*s.*)—W. A. & R. F. Spencer, Chelmscote, Banbury.
2719 II. (15*s.*)—T. Sugden, Ollerton Farm, Withnell, Chorley.
2713 R. N. & H. C.—T. H. Furness. 2714 H. C.—T. Lockwood.

Class 272.—*Silver Laced Wyandotte Hens.* [10 entries, none absent.]

2727 I. (30*s.*)—H. PICKLES, Kayfield House, Earby, Colne.
2728 II. (15*s.*)—C. PRESTON, Manor House, Earlsheaton. May 4, 1897.
2722 III. (10*s.*)—TOM H. FURNESS, Saltergate House, Chesterfield.
2729 R. N. & H. C.—W. A. & R. F. SPENCER, Chelmscote, Banbury.
2726 H. C.—J. G. MORTEN. 2723 Com.—MRS. GRIMWADE.

Class 273.—*Silver Laced Wyandotte Cockerels.*
[17 entries, 6 absent.]

2739 I. (30*s.*), & 2738 II. (15*s.*)—MRS. FRANKLIN, Syston Old Hall, Grantham. Jan.
2731 III. (10*s.*)—JOHN BENNETT, Kingswood, Birmingham. Jan.
2744 R. N. & H. C.—H. PICKLES, Kayfield House, Earby, Colne.
H. C.—MRS. GRIMWADE, for No. 2741; C. PRESTON, for No. 2745.

Class 274.—*Silver Laced Wyandotte Pullets.*
[17 entries, 3 absent.]

2754 I. (30*s.*)—TOM H. FURNESS, Saltergate House, Chesterfield.
2751 II. (15*s.*), & 2750 III. (10*s.*)—MRS. F. DARRELL, Teddington Hall, Middlesex. Jan. 11.
2761 R. N. & H. C.—CHARLES PRESTON, Manor House, Earlsheaton, Yorks.
2758 H. C.—H. MAIDMENT. 2760 Com.—H. PICKLES.

Class 275.—*Gold Laced or White Wyandotte Cocks.*
[17 entries, 4 absent.]

2765 I. (30*s.*)—ABBOT BROS., Thuxton, Norfolk. 1897.
2779 II. (15*s.*)—T. SUGDEN, Ollerton Farm, Withnell, Chorley.
2778 III. (10*s.*)—W. A. & R. F. SPENCER, Chelmscote, Banbury. 1897.
2776 R. N. & H. C.—MRS. PIERSON, Little Fransham Rectory, East Dereham.
2775 H. C.—H. PICKLES. 2764 Com.—ABBOT BROS.

Class 276.—*Gold Laced or White Wyandotte Hens.*
[10 entries, 1 absent.]

2783 I. (30*s.*)—TOM H. FURNESS, Saltergate House, Chesterfield.
2788 II. (15*s.*)—J. G. MORTEN, Rowsley, Derby.
2789 III. (10*s.*)—H. PICKLES, Kayfield House, Earby, Colne.
2782 R. N. & H. C.—VISCOUNT DEERHURST, Woolstone, Cheltenham.
2784 H. C.—HAYWARD & WALTERS. 2787 Com.—W. J. JEBBITT.

Class 277.—*Gold Laced or White Wyandotte Cockerels.*
[19 entries, 5 absent.]

2795 I. (30*s.*)—A. J. BROCK, 19 St. Peter's Street, Canterbury. Jan. 1.
2802 II. (15*s.*)—R. HESLOP, Higher Barker, Goosnargh, Preston Jan.
2801 III. (10*s.*)—M. G. GOLDSMITH, Blendworth, Horndean. Jan. 2.
2804 R. N. & H. C.—H. PICKLES, Kayfield House, Earby, Colne.
2798 H. C.—C. BUTCHER. 2800 Com.—M. G. GOLDSMITH.

Class 278.—*Gold Laced or White Wyandotte Pullets.*
[17 entries, 3 absent.]

2821 I. (30*s.*)—H. PICKLES, Kayfield House, Earby, Colne.
2826 II. (15*s.*)—ROBERT THOMPSON, Arndale, Arnside, Carnforth. Jan. 8.
2820 III. (10*s.*)—J. G. MORTEN, Rowsley, Derby.
2813 R. N. & H. C., & 2814 H. C.—R. H. BROOKSBANK.
2815 Com.—CHARLES BUTCHER.

Minorcas.

Class 279.—*Minorca Cocks.* [15 entries, none absent.]

2832 I. (30*s.*)—MOGRIDGE & GARLICK, 69 Clifton Street, Lytham.
2834 II. (15*s.*)—S. PARKER, 261 Green Lane, Birchills, Walsall. May 1897.
2827 III. (10*s.*)—ABBOT BROS., Thuxton, Norfolk. 1897.
2828 R. N. & H. C.—JOHN W. CROSSMAN, Galphay, Ripon.
2836 H. C.—A. G. PITTS. 2839A. Com.—F. STRATTON.

Class 280.—*Minorca Hens.* [21 entries, none absent.]

2847 I. (30*s.*)—MOGRIDGE & GARLICK, 69 Clifton Street, Lytham.
2855 II. (15*s.*)—T. C. PLOWMAN, 155 Queen's Road, Finsbury Park, N. 1897.
2852 III. (10*s.*)—JOHN PEERS, 40 Burrows Street, Walsall. 1897.
2844 R. N. & H. C.—W. C. H. EWEN, Rhodyate House, Congresbury, Som.
2854 H. C.—A. G. PITTS. 2859 Com.—SHAW & SHEPLEY.

Class 281.—*Minorca Cockerels.* [10 entries, none absent.]

2869 I. (30*s.*)—WADE BROS., Silsden, Keighley, Yorks. Feb 1.
2866 II. (15*s.*)—JOHN GILLIES, Edington Mills, Chirnside, N.B. Jan. 15.
2865 III. (10*s.*)—W. GILL, 13 Strawberry Cottages, Silsden, Yorks. Jan. 30.
2863 R. N. & H. C., & 2864 H. C.—L. & T. FAWKES.
2870 Com.—THOMAS H. WHITEHOUSE.

Class 282.—*Minorca Pullets.* [11 entries, none absent.]

2882 I. (30*s.*)—WADE BROS., Silsden, Keighley, Yorks. Feb 1.
2880 II. (15*s.*)—SHAW & SHEPLEY, Rose Green, Glossop. Jan. 10.
2877 III. (10*s.*)—W. GILL, 13 Strawberry Cottages, Silsden, Yorks. Jan. 30.
2872 R. N. & H. C.—ABBOT BROS., Thuxton, Norfolk.
2878 H. C.—J. GILLIES. 2879 Com.—W. T. HOARE.

Leghorns.

Class 283.—*White Leghorn Cocks.* [5 entries, 1 absent.]

2884 I. (30*s.*)—JOHN A. BOOTH, Rhodes House, Middleton, Lancs.
2887 II. (15*s.*)—WADE BROS., Silsden, Keighley, Yorks.
2886 R. N. & H. C.—MOGRIDGE BROS. 2885 H. C.—MRS. LISTER-KAY.

Class 284.—*White Leghorn Hens.* [9 entries, 1 absent.]

2889 I. (30*s.*)—JOHN A. BOOTH, Rhodes House, Middleton, Lancs.
2894 II. (15*s.*)—STANBURY BROS., Little Gate Farm, Paignton, Devon.
2895 III. (10*s.*)—WADE BROS., Silsden, Keighley, Yorks.
2893 R. N. & H. C.—MOGRIDGE BROS., 69 Clifton Street, Lytham.
2891 H. C.—GEORGE CROOKS. 2890 Com.—MISS CLABBURN.

Class 285.—*Leghorn Cocks, any other colour.* [5 entries.]

2898 I. (30*s.*)—JOHN HURST, South Terrace, Glossop. Mar. 1897.
2901 II. (15*s.*)—THE REV. J. H. B. WOLLOCOMBE, Lamerton, Tavistock.
2900 III. (10*s.*)—WADE BROS., Silsden, Keighley, Yorks.
2897 R. N. & H. C.—G. F. HIGGINSON. 2899 H. C.—THE Rev. T. W. STURGES.

Class 286.—*Leghorn Hens, any other colour.* [11 entries, 2 absent.]

2904 I. (30*s.*)—JOHN HURST, South Terrace, Glossop. Apr. 1897.
2910 II. (15*s.*)—W. TAYLOR, Top Common, Belper, Derby. May 7, 1897.

2903 III. (10*s.*)—GEORGE F. HIGGINSON, Granville House, Tenbury. 1897.
2907 R. N. & H. C.—I. LEWTHWAITE, Black Beck, Beckermet, Cumberland.
2909 H. C.—THE REV. T. W. STURGES. 2911 Com. -J. WALTON.

Class 287.—*Leghorn Cockerels, any colour.* [11 entries, 2 absent.]

2922 I. (30*s.*)—WADE BROS, Silsden, Keighley, Yorks. Jan. 7.
2914 II. (15*s.*)—CHARLES S. BOOTH, Rhodes House, Middleton, Lancs. Jan.
2920 III. (10*s.*)—DR. MOSSOP, Newhaven, Sussex. Feb.
2919 R. N. & H. C.—MOGRIDGE BROS., 69 Clifton Street, Lytham.
2916 H. C.—W. HINSON. 2915 Com.—W. GILL.

Class 288.—*Leghorn Pullets, any colour.* [12 entries, 3 absent.]

2933 I. (30*s.*)—WADE BROS., Silsden, Keighley, Yorks. Jan. 7.
2930 II. (15*s.*)—MOGRIDGE BROS., 69 Clifton Street, Lytham. Jan. 7.
2934 III. (10*s.*)—THE REV. J. H. B. WOLLOCOMBE, Lamerton, Tavistock.
2931 R. N. & H. C.—DR. MOSSOP, Newhaven.
2925 H. C.—C. S. BOOTH. 2935 Com.—C. F. YOUNG.

Orpingtons.

Class 289.—*Orpington Cocks.* [18 entries, 3 absent.]

2946 I. (30*s.*), & 2947 III. (10*s.*)—J. PARTINGTON, Lytham. 1 year.
2948 II. (15*s.*)—R. DE C. PEELE, Church House, Ludlow. Feb. 1897.
2938 R. N. & H. C.—WILLIAM COOK & SONS, St. Mary Cray, Kent.
2939 H. C.—W. & H. CROSS. 2942 Com.—V. G. HUNTLEY.

Class 290.—*Orpington Hens.* [19 entries, none absent.]

2964 I. (30*s.*) & 2963 II. (15*s.*)—J. PARTINGTON, Lytham. 1 year.
2965 III. (10*s.*)—R. DE C. PEELE, Church House, Ludlow. 1896.
2966 R. N. & H. C.—H. M. POLLETT, Fernside, Bickley, Kent.
2958 H. C.—W. & H. CROSS. 2961 Com.—HALLAM & LITTING.

Class 291.—*Orpington Cockerels.* [18 entries, 2 absent.]

2981 I. (30*s.*)—R. DE C. PEELE, Church House, Ludlow. Jan.
2980 II. (15*s.*)—JOSEPH PARTINGTON, The Woodlands, Lytham.
2988 III. (10*s.*)—F. E. WALKER, Escrick, York. Jan. 4.
2979 R. N. & H. C.—HALLAM & LITTING, Erdington, Birmingham.
2983 H. C.—W. SMITH. 2990 Com.—MRS. WILKINSON.

Class 292.—*Orpington Pullets.* [20 entries, 2 absent.]

2998 I. (30*s.*) & 2999 III. (10*s.*)—J. PARTINGTON, Lytham.
2996 II. (15*s.*)—HALLAM & LITTING, Erdington, Birmingham. Jan. 20.
3000 R. N. & H. C.—R. DE C. PEELE, Church House, Ludlow.
H. C.—W. COOK & SONS, for No. 2993; MRS. WILKINSON, for No. 3010
3008 Com.—R. R. WHITFIELD.

Andalusians.

Class 293.—*Andalusian Cocks or Cockerels.* [11 entries, 3 absent.]

3021 I. (30*s.*)—THE REV. J. H. B. WOLLOCOMBE, Lamerton, Tavistock. 1897.
3020 II. (15*s.*)—A. E. W. PORTER, Mount Villa, Bridgwater, Somerset.
3018 III. (10*s.*)—ISAAC W. MORRISS, Ely, Cambs. Jan. 18, 1898.
3015 R. N. & H. C.—JAMES H. HAWORTH.
3017 H. C.—R. LITTLE, JUN. 3012 Com.—H. BATE.

Class 294.—*Andalusian Hens or Pullets.* [12 entries, 2 absent.]

3029 I. (30*s.*)—R. LITTLE, JUN., Rokeby Cottage, Glossop. 2 years.
3027 II. (15*s.*)—J. H. HAWORTH, Love Clough, Rawtenstall. May 12, 1897.
3032 III. (10*s.*)—A. E. W. PORTER, Mount Villa, Bridgwater, Somerset.
3033 R. N. & H. C.—THE REV. J. H. B. WOLLOCOMBE, Lamerton, Tavistock.
H. C.—ABBOT BROS., for No. 3022; HENRY BATE, for No. 3023; MRS. BLACKET GILL, for No. 3025.

Hamburghs.

Class 295.—*Hamburgh Cocks or Cockerels, any variety.* [4 entries.]

3034 I. (30*s.*)—THE REV. S. ASHWELL, Finmere Rectory, Buckingham. 1897.
3036 II. (15*s.*)—H. PICKLES, Kayfield House, Earby, Colne. May 15, 1897.
3037 R. N. & H. C.—W. SNELL. 3035 H. C.—JOHN FLEMING.

Class 296.—*Hamburgh Hens or Pullets, any variety.* [4 entries, 1 absent.]

3039 I. (30*s.*)—H. PICKLES, Kayfield House, Earby, Colne.
3040 II. (15*s.*)—W. SNELL, 129 High Street, Crediton. Apr. 20, 1896.
3038 R. N. & H. C.—W. H. AVERY, Olton House, Yardley, Birmingham.

Any Other Recognised Breeds. *(Bantams excepted.)*

Class 297.—*Cocks.* [15 entries, 1 absent.]

3052 I. (30*s.*)—JOSEPH PARTINGTON, The Woodlands, Lytham. (Polish.)
3053 II. (15*s.*)—R. DE C. PEELE, Church House, Ludlow. (Malay.) 1897.
3054 III. (10*s.*)—J. POWELL, Myrtle Royd, Bingley. (Spanish.) May 14, 1897.
3047 R. N. & H. C.—R. FITTON. (Black Red Modern Game.)
H. C.—ABBOT BROS., for No. 3042 (White Madras Game); R. H. DRAPER, for No. 3046 (Malay); JOHN MOORE, for No. 3050 (Buff Wyandotte); JOHN SMITH, for No. 3055 (Spanish).
Com.—VISCOUNT DEERHURST, for No. 3044 (Buff Wyandotte); S. H. HYDE, for No. 3048 (Spanish); W. H. JOHNSON, for No. 3049 (Black Red Modern Game).

Class 298.—*Hens.* [14 entries, 1 absent.]

3068 I. (30*s.*)—J. POWELL, Myrtle Royd, Bingley. (Spanish.) Mar. 1, 1897.
3066 II. (15*s.*)—J. PARTINGTON, The Woodlands, Lytham. (Polish.) 1 year.
3067 III. (10*s.*)—R. DE C. PEELE, Church House, Ludlow. (Malay.) 1897.
3059 R. N. & H. C.—THE COUNTESS OF CRAVEN. (Buff Wyandotte.)
H. C.—ABBOT BROS., for No. 3057 (White Madras Game); J. C. BACON, for No. 3058 (Black Red Modern Game); S. H. HYDE, for No. 3064 (Spanish); J. MOORE, for No. 3065 (Buff Wyandotte); J. SMITH, for No. 3069 (Spanish).
Com.—THE HON. E. A. FITZROY, for No. 3062 (Scotch Grey); R. HOLMES, for No. 3063 (Ancona).

Class 299.—*Cockerels.* [6 entries, none absent.]

3075 I. (30*s.*)—JOHN POWELL, Myrtle Royd, Bingley. (Spanish.) Jan. 3.
3073 II. (15*s.*)—JOHN FRAYN, St. Stephen's, Launceston. (Malay.) Jan. 2.
3074 III. (10*s.*)—S. H. HYDE, Kempton Park, Sunbury-on-Thames. (Spanish.) Jan. 20.
3076 R. N. & H. C.—JOHN SMITH. (Spanish.)

Class 300.—*Pullets.* [5 entries, none absent.]

3080 I. (30*s.*)—JOHN POWELL, Myrtle Royd, Bingley. (Spanish.) Jan. 3.
3079 II. (15*s.*)—S. H. HYDE, Kempton Park, Sunbury. (Spanish.) Jan. 20.
3077—R. N. & H. C.—WILLIAM R. BULL. (Buff Wyandotte.)
3081 H. C.—JOHN SMITH. (Spanish.)

DUCKS.

Aylesbury.

Class 301.—*Aylesbury Drakes.* [8 entries, 3 absent.]

3084 I. (30*s.*) & 3085 II. (15*s.*)—JOHN GILLIES, Edington Mills, Chirnside, N.B
3087 R. N.—J. R. R. MITCHELL, Reynolds, St. Thomas, Exeter.

Class 302.—*Aylesbury Ducks.* [7 entries, 2 absent.]

3092 I. (30*s.*)—JOHN GILLIES, Edington Mills, Chirnside, N.B. 1896.
3095 II. (15*s.*)—FRED READ, Aston Clinton, Tring. Mar. 20, 1897.
3094 R. N.—J. R. R. MITCHELL, Reynolds, St. Thomas, Exeter.

Class 303.—*Aylesbury Young Drakes.* [7 entries, 1 absent.]

3102 I. (30*s.*)—F. READ, Aston Clinton, Tring. Feb. 20.
3099 II. (15*s.*) & 3098 III. (10*s.*)—JOHN GILLIES, Chirnside, N.B. Apr.
3103 R. N. & H. C.—F. READ.
3101 H. C.—WILLIAM POTTER.

Class 304.—*Aylesbury Ducklings.* [7 entries, 1 absent.]

3109 I. (30*s.*) & 3110 II. (15*s.*)—FRED READ, Aston Clinton, Tring. Feb. 20.
3108 III. (10*s.*)—WILLIAM POTTER, Weston Turville, Tring. Mar. 1.
3105 R. N. & H. C.—JOHN GILLIES. 3107 Com.—PERCY PERCIVAL.

Rouen.

Class 305.—*Rouen Drakes.* [9 entries, none absent.]

3117 I. (30*s.*) & 3116 II. (15*s.*)—J. PARTINGTON, Lytham. 1 year.
3114 III. (10*s.*) & 3112 R. N. & H. C.—VINCENT G. HUNTLEY, Trowbridge.
3118 H. C.—A. T. & H. PEARS.

Class 306.—*Rouen Ducks.* [8 entries, none absent.]

3120 I. (30*s.*)—JOHN GILLIES, Edington Mills, Chirnside, N.B. 1896.
3126 II. (15*s.*) & 3125 III. (10*s.*)—J. PARTINGTON, Lytham. 1 year.
3123 R. N. & H. C., 3121 H. C., & 3122 Com.—VINCENT G. HUNTLEY.

Pekin.

Class 307.—*Pekin Drakes.* [8 entries, none absent.]

3129 I. (30*s.*)—S. H. BROWN, 136 Easton Road, Bristol. 3 years.
3128 II. (15*s.*)—T. ALLEN, Crookwood Farm, Devizes.
3133 III. (10*s.*)—OWEN PHILLIPS, Kemerton Court, Tewkesbury. 3 years.
3130 R. N. & H. C.—THE REV. W. HURST, Ramsey Vicarage, Harwich.
Com.—C. I. INGLIS, for No. 3131; OWEN PHILLIPS, for No. 3134; H. R. WILKINSON, for No. 3135.

Class 308.—*Pekin Ducks.* [7 entries, none absent.]

3141 **I.** (30*s.*)—OWEN PHILLIPS, Kemerton Court, Tewkesbury. 2 years.
3140 **II.** (15*s.*)—J. R. R. MITCHELL, Reynolds, St. Thomas, Exeter.
3137 **III.** (10*s.*)—THE REV. WILLIAM HURST, Ramsey Vicarage, Harwich.
3136 **R. N. & Com.**—T. ALLEN, Crookwood Farm, Devizes.

Cayuga.

Class 309.—*Cayuga Drakes.* [7 entries, none absent.]

3143 **I.** (30*s.*)—MRS. T. W. BOURNE, Well Croft Villa, Leigh, Stoke-on-T. 1895.
3147 **II.** (15*s.*)—R. S. WILLIAMSON, Rawnsley, Hednesford, Staffs.
3148 **III.** (10*s.*)—LADY WILSON, Chillingham Barns, Belford. May, 1896.
3146 **R. N. & H. C.**—H. PAGE, Moat Farm, Abbots Salford, Evesham.
3144 **H. C.**—VISCOUNT DEERHURST. 3145 **Com.**—E. KENDRICK.

Class 310.—*Cayuga Ducks.* [5 entries, none absent.]

3153 **I.** (30*s.*)—LADY WILSON, Chillingham Barns, Belford. May 1896.
3152 **II.** (15*s.*)—R. S. WILLIAMSON, Rawnsley, Hednesford, Staffs.
3150 **III.** (10*s.*)—VISCOUNT DEERHURST, Woolstone, Cheltenham. 1897.
3154 **R. N. & H. C.**—LADY WILSON.

Any Breeds. (*Aylesburys excepted.*)

Class 311.—*Young Drakes.* [6 entries, 2 absent.]

3159 **I.** (30*s.*)—A. T. & H. PEARS, Mere, Lincoln. (Rouen.) Feb. 7.
3155 **II.** (15*s.*)—THE HON. SYBIL M. T. AMHERST, Didlington Hall, Brandon. (Pekin.) Apr. 1.
3160 **III.** (10*s.*)—OWEN PHILLIPS, Kemerton Court, Tewkesbury. (Pekin.)
3157 **R. N. & H. C.**—VISCOUNT DEERHURST. (Cayuga.)

Class 312.—*Ducklings.* [5 entries.]

3164 **I.** (30*s.*)—A. T. & H. PEARS, Mere, Lincoln. (Rouen.) Feb. 7.
3161 **II.** (15*s.*)—THE HON. SYBIL M. T. AMHERST, Didlington Hall, Brandon. (Pekin.) Apr. 1.
3163 **III.** (10*s.*)—C I. INGLIS, Ashby Parva, Lutterworth. (Rouen.) Mar.
3162 **R. N. & H. C.**—VISCOUNT DEERHURST. (Cayuga.) 3165 **Com.**—OWEN PHILLIPS. (Pekin.)

Geese.

Class 313.—*Embden Ganders.* [4 entries, none absent.]

3166 **I.** (£2.)—ABBOT BROS, Thuxton, Norfolk. 1896.
3168 **II.** (£1.)—H. T. GOODENOUGH, Milton Common, Tetsworth. Feb. 27, 1896.
3169 **R. N. & Com.**—MRS. LOUISA STRICKLAND, Carlton Miniott, Thirsk.

Class 314.—*Embden Geese.* [5 entries, 1 absent.]

3170 **I.** (£2.), & 3171 **III.** (10*s.*)—ABBOT BROS., Thuxton, Norfolk. 1896.
3173 **II.** (£1.)—H. T GOODENOUGH, Milton Common, Tetsworth.
3172 **R. N. & H. C.**—THE HON. SYBIL M. T. AMHERST.

Class 315.—*Toulouse Ganders.* [4 entries.]

3178 **I.** (£2.), & 3177 **II.** (£1.)—R. J. SERGEANT, Thornton Abbey, Ulceby.
3175 **III.** (10*s.*)—ALLEN COOKE, Whiteley Green, Adlington, Macclesfield.
3176 **R. N. & H. C.**—J. R. R. MITCHELL, Reynolds, St. Thomas, Exeter.

Class 316.—*Toulouse Geese.* [2 entries.]

3179 I. (£2.)—ALLEN COOKE, Whiteley Green, Adlington, Macclesfield.
3180 R. N. & Com.—J. R. R. MITCHELL, Reynolds, St. Thomas, Exeter.

Turkeys.

Class 317.—*Turkey Cocks.* [20 entries, 1 absent.]

3198 I. (£2.)—LADY WILSON, Chillingham Barns, Belford. (Bronze.) 1895.
3181 II. (£1.)—ABBOT BROS., Thuxton, Norfolk. (Mammoth Bronze.) 1896.
3188 III. (10*s*.)—VINCENT G. HUNTLEY, Trowbridge. (American Bronze.)
3190 R. N. & H. C.—EDWARD KENDRICK, Weeford House, Lichfield. (Bronze.)
H. C.—B. H. BROOKSBANK, for No. 3185; T. ROGERS, for No. 3195; MRS. WILLIAMS, for No. 3197; LADY WILSON, for No. 3199; C. F. YOUNG, for No. 3200.
Com.—H. G. B. BAKER, for Nos. 3182 & 3183; A. BRADBURNE, for No. 3184; M. LAWSON, for No. 3192; MRS. PASSINGHAM, for No. 3194.

Class 318.—*Turkey Hens.* [20 entries, 1 absent.]

3219 I. (£2.)—LADY WILSON, Chillingham Barns, Belford. (Bronze.) 1896.
3218 II. (£1.)—MRS. WILLIAMS, Hawkstone Hotel, Shrewsbury. (Canadian Bronze.)
3201 III. (10*s*.)—ABBOT BROS, Thuxton, Norfolk. (Mammoth Bronze.) 1897.
3207 R. N. & H. C.—W. JOHNSON. 3216 H. C.—MRS. F. C. SMITH.
Com.—H. T. GOODENOUGH, for No. 3205; E. KENDRICK, for Nos. 3208 & 3209; J. R. R. MITCHELL, for No. 3212; T. ROGERS, for No. 3214.

Table Poultry.

Class 319.—*Pairs of Cockerels of* 1898 *of any pure breeds.* [9 entries, 1 absent.]

3223 I. (30*s*.)—WILLIAM BRENT, Clampit, Callington. (Indian Game.)
3224 II. (15*s*.)—R. W. CRESWELL-WARD, Neasham Hill, Darlington. (Buff Wyandotte.) Jan. 8.
3229 III. (10*s*.)—LADY WILSON, Chillingham Barns, Belford. (Langshan.) Jan. 12.
3227 R. N. & H. C.—J. R. WADMAN, Hurstmonceux, Hailsham. (Plymouth Rock.)
3222 H. C., & 3221 Com.—THE REV. J. A. G. BIRCH.

Class 320.—*Pairs of Pullets of* 1898 *of any pure breeds.* [8 entries, none absent.]

3236 I. (30*s*.)—FRED R. WEBER, Granthams, Chiddingfold, Godalming. (Dorking.) Jan 5.
3231 II. (15*s*.)—THE REV. J. A. G. BIRCH, Kirk Hammerton, York. (Indian Game.) Jan.
3237 III. (10*s*.)—LADY WILSON, Chillingham Barns, Belford. (Langshan.) Jan. 12.
3233 R. N. & H. C.—C. BURRELL FULLER. (Dorking.)
H. C.—THE HON. FLORENCE M. T. AMHERST, for No. 3230; R. H. SUTTON, for No. 3235.
3234 Com.—HERBERT REEVES.

Class 321.—*Pairs of Cockerels of* 1898 *of a first cross (Indian Game-Dorking or Dorking-Indian Game).* [10 entries, 1 absent.]

3246 I. (30*s*.)—FRED R. WEBER, Granthams, Chiddingfold, Godalming. Jan. 5.
3247 II. (15*s*.)—LADY WILSON, Chillingham Barns, Belford. Jan 4.

3239 III. (10*s.*)—CHARLES E. BROOKE, The Manor, Baynards, Horsham.
3243 R. N. & H. C.—R. H. SUTTON, Redlands, Heathfield, Sussex.
3244 H. C.—J. R. WADMAN. 3238 Com.—THE REV. J. A. G. BIRCH.

Class 322.—*Pairs of Pullets of* 1898 *of a first cross* (*Indian Game-Dorking or Dorking-Indian Game*). [7 entries, none absent.]

3250 I. (30*s.*)—WILLIAM HAMBLY, Cutlinwith, St. Germans. Jan. 5.
3252 II. (15*s.*)—R. H. SUTTON, Redlands, Heathfield, Sussex. Feb.
3249 III. (10*s.*)—LADY DE ROTHSCHILD, Aston Clinton, Tring. Feb. 8.
3253 R. N. & H. C.—LADY WILSON, Chillingham Barns, Belford.
H. C.—C. E. BROOKE, for No. 3248; LADY WILSON, for No. 3254.

Class 323.—*Pairs of Cockerels of* 1898 *of a first cross* (*Indian Game-Dorking and Dorking-Indian Game excepted*) *from any pure breeds.* [7 entries, none absent.]

3255 I. (30*s.*)—C. E. BROOKE, Baynards, Horsham. (Dorking & Plymouth Rock)
3259 II. (15*s.*)—H. N. HODGES, Willenhall, Coventry. (Buff Orpington & Dorking.) Jan. 2.
3261 III. (10*s.*)—JOHN R. WADMAN, Hurstmonceux, Hailsham, Sussex. (Indian Game & Sussex.) Feb. 11.
3256 R. N. & H. C.—LADY DE ROTHSCHILD. (Brahma & Dorking.)

Class 324.—*Pairs of Pullets of* 1898 *of a first cross* (*Indian Game-Dorking and Dorking-Indian Game excepted*) *from any pure breeds.* [6 entries, none absent.]

3262 I. (30*s.*)—C. E. BROOKE, Baynards, Horsham. (Dorking & Plymouth Rock.)
3263 II. (15*s.*)—LADY DE ROTHSCHILD, Aston Clinton, Tring. (Brahma & Dorking.) Feb.
3265 III. (10*s.*)—H. N. HODGES, Willenhall, Coventry. (Buff Orpington & Dorking.) Jan. 2.
3264 R. N. & H. C.—MISS M. DOLBEN. 3267 H. C.—J. R. WADMAN.

Table Ducklings.

Class 325.—*Pairs of Ducklings of* 1898 *of any pure breeds.* [14 entries, 2 absent.]

3279 I. (30*s.*)—FRED R. WEBBER, Granthams, Chiddingfold, Godalming. (Aylesbury.) Mar. 21.
3275 II. (15*s.*)—FRED READ, Aston Clinton, Tring. (Aylesbury.) Apr. 7.
3273 III. (10*s.*)—W. POTTER, Weston Turville, Tring. (Aylesbury.) Apr. 7.
3281 R. N. & H. C.—H. G. WESTON, Mount Street, Aylesbury.
H. C.—W. T. COUZENS, for No. 3268; F. READ, for No. 3274; P. WALSH, for No. 3278.
Com.—P. PERCIVAL, for No. 3270; O. PHILLIPS, for No. 3271.

Class 326.—*Pairs of Ducklings of* 1898 *of a first cross from any pure breeds.* [6 entries, none absent.]

3284 I. (30*s.*)—WILLIAM POTTER, Weston Turville, Tring. (Aylesbury & Pekin.) Apr. 7.
3285 II. (15*s.*)—FRED READ, Aston Clinton, Tring. (Aylesbury & Pekin.) Apr. 2.
3282 III. (10*s.*)—W. T. COUZENS, Alpraham, Tarporley, Cheshire. (Pekin & Aylesbury.) Apr. 17.
3287 R. N. & H. C. & 3286 H. C.—PETER WALSH.

FARM AND DAIRY PRODUCE OF THE UNITED KINGDOM.

Butter.

Class 327.—*Kegs or other Packages of Butter, not less than* 14 *lb. and under* 40 *lb. in weight, delivered on or before Saturday, May 7th,* 1898. [27 entries, 3 absent.]

3303 I. (£10.)—CAPT. W. A. W. LAWSON, Staveley, Melton Mowbray. (Jersey Cows: Separated cream, churned at 56° F., salted in the grain. Made May 5.)
3292 II. (£5.)—THE COAGH CO-OPERATIVE DAIRY SOCIETY, LTD., Coagh, co. Tyrone. (Separated and ripened cream, churned at 56° F., brined in the grain. Made May 4.)
3290 R. N. & H. C.—J. H. BARRY, Ballyvonare, Buttevant, co. Cork. (Shorthorn Cows: separated cream, churned at 58° F., salted on butter worker. Made May 4.)
H. C.—CHARLES HAYES, for No. 3298; MRS. JAMES HODGINS, for No. 3299; JOHN WILLIAMS, for No. 3313.
Com.—J. K. O'CONNOR, for No. 3307; THE EARL OF ROSEBERY, K.G., for No. 3309.

Class 328.—*Boxes of twelve two-pound rolls of Butter, made with not more than* 1 *per cent. of salt.* [14 entries, 1 absent.]

3226 II. (£3.)—THE LISSARDA CO-OPERATIVE DAIRY SOCIETY, Lissarda, Crookstown, co. Cork.
3318 III. (£2.)—THE COAGH CO-OPERATIVE DAIRY SOCIETY, LTD., Coagh, co. Tyrone.
3323 R. N.—THE RT. HON. R. W. HANBURY, M.P., Ilam Hall, Ashbourne.

Class 329.—*Two pounds Fresh Butter, slightly Salted.* [107 entries, 3 absent.]

3410 (£5.)—LORD ROTHSCHILD, Tring Park, Herts.
3422 (£5.)—THE REV. W. OSWELL THOMPSON, Framfield Vicarage, Uckfield.
3427 (£5.)—MISS URWIN, Dunskins, Wolsingham, R S.O., co. Durham.
3435 (£5.)—RICHARD WORSLEY, Broxmead, Cuckfield, Sussex.
3350 (£3.)—THE COUNTESS OF CRAWFORD, Haigh Hall, Wigan.
3387 (£3.)—MRS. CHARLOTTE MCINTOSH, Havering Park, Romford.
3430 (£3.)—MISS MARIA F. WALLATOR, Haddocks Farm, Bewdley.
3434 (£3.)—LORD WINDSOR, Hewell Hall, Redditch.
3407 (£1.)—LORD POLTIMORE, Poltimore Park, Exeter.
3409 (£1.)—THE EARL OF ROSEBERY, K.G., Mentmore, Leighton Buzzard.
3416 (£1.)—A. F. SOMERVILLE, Dinder, Wells, Somerset.
3432 (£1.)—JOHN WILLIAMS, Regilbury Park, Winford, Bristol.
3431 R. N. & H. C.—H. T. WILLIAMS, Belbroughton Lodge, Stourbridge.
H. C.—J. BAINES, for No. 3332; M. J. WILLIAMS, for No. 3433.
Com.—MRS E. FRANCE, for No. 3358; THE HON. A. HOLLAND-HIBBERT, for No. 3372; E. E. HUTTON, for No. 3373.

Class 330.—*Two pounds Fresh Butter, slightly Salted, made from Milk drawn from Cows other than Channel Islands, or Cows crossed with the Channel Islands Breeds.* [77 entries, none absent.]

3487 (£5.)—HENRY PARRY, Hafod-y-Rhug, Llanrug, R.S.O.. Carnarvon.
3496 (£5.)—MISS S. S. SPARROW, Ellis Farm, Hardwicke, Gloucester.

3506 (£5.)—JOHN WILLIAMS, Regilbury Park, Winford, Bristol.
3453 (£3.)—THE COUNTESS OF CRAWFORD, Haigh Hall, Wigan.
3465 (£3.)—CHARLES HAYES, Keyford House Farm, Frome.
3467 (£3)—THE HON. A. HOLLAND-HIBBERT, Munden, Watford.
3501 (£3.)—MISS URWIN, Dunskins, Wolsingham, R.S.O , co. Durham.
3451 (£1)—WILLIAM H. COCKS, Roselydden, Helston, Cornwall.
3455 (£1)—MRS. T. EMERY, Elm Tree Farm, Portbury, Bristol.
3460 (£1.)—ANTONY GIBBS, Tyntesfield, Bristol.
3488 (£1.)—MISS DORA H. PATTISON, East Farm, Tunstall, Sunderland.
3491 **R. N. & H. C.**—LORD POLTIMORE. 3509 **H. C.**—LORD WINDSOR.

Cheese.

Class 331.—*Three Cheddar Cheeses, of not less than* 50 *lb. each, made in* 1898. [18 entries, 1 absent.]

3518 **I.** (£10.)—F. W. J. CROCKER, Redford Farm, Batcombe, Cattistock.
3530 **II.** (£5.)—HERBERT E. TUCKER, Steeple Ashton, Trowbridge.
3519 **III.** (£3.)—J. C. CUNINGHAME, Dunragit, Wigtownshire.
3527 **R. N. & H. C.**—W. C. SPENCER, Hooke, Beaminster, Dorset.]
H. C.—T. C. CANDY, for No. 3516; J. MARTIN, for No. 3524.
Com.—H. G. ASHMAN, for No. 3513; W. J. SELWAY, for No. 3526; SIR M. J. MCTAGGART STEWART, BT., M.P., for No. 3528.

Class 332.—*Three Cheshire Cheeses of not less than* 40 *lb. each, made in* 1898. [23 entries, 4 absent.]

3539 **I.** (£10.)—JOHN DUTTON, JUN., Bridgemere Farm, Nantwich.
3549 **II.** (£5.)—GEORGE MOSFORD, Tattenhall, Chester.
3552 **III.** (£3.)—JOHN ROBSON, Coole Lane Farm, Audlem, Nantwich.
3548 **R. N. & H. C.**—SAMUEL JOHNSON, Gadlas Farm, Ellesmere.
H. C.—E. COOKSON, for No. 3533; T. DUTTON, for No. 3541; C. EMBERTON, for No. 3544.
Com.—J. BLAKE, for No. 3532; W. DUTTON, for No. 3542; E. GOULDBOURN, for No. 3547; G. PLATT, for No. 3551.

Class 333.—*Three Stilton Cheeses, made in* 1898. [18 entries, 1 absent.]

3566. **I.** (£10.)—JOHN SMITH, Gaddesby, Leicester.
3562 **II.** (£5.)—ALBERT HULL, Frisby House, Billesdon, Leicester.
3561 **III.** (£3.)—GEORGE HODGKINSON, Kirby Bellairs, Melton Mowbray.
3560 **R. N. & H. C.**—MRS. FAIRBROTHER, Beeby, Leicester.
H. C.—H. EDGSON, for No. 3559; J. THURMAN, for No 3568; J. C. WILFORD, for No. 3571.
Com.—MRS. EARP, for No. 3558; W. RICHARDSON, for No. 3565.

Class 334.—*Three Cheeses, of any other British make, made in* 1898. [37 entries, 2 absent.]

3577 **I.** (£10.)—T. BRITTAIN, Drayton Lodge, Nuneaton. (Leicester.)
3584 **II.** (£5.)—F. W. T. CROCKER, Redford Farm, Batcombe, Cattistock. (Somerset Thick.)
3578 **III.** (£3.)—R. BROWN, Walton Bank, Stone, Staffs. (Leicester.)
3601 **IV.** (£2.)—W. J. SELWAY, Manor Farm, West Cranmore, Shepton Mallet. (Truckle.)
3594 **R. N. & H. C.**—E. T. GREEN (North Wilts Loaf).

3594 H. C.—W. C. KIRKMAN. (Leicester.)
Com.—E. BARTON, for No. 3575 (Lancashire); T. C. CANDY, for No. 3580 (Somerset Thin).

Class 335.—*Three Cream Cheeses, made with the use of Rennet.* [9 entries, 1 absent.]

3617 I. (£2.)—THE UNITED CREAMERIES, LTD., Dunragit, Wigtownshire.
3615 II. (£1.)—MRS. CHARLOTTE MCINTOSH, Havering Park, Romford.
3613 R. N. & H. C.—CAPT. LAWSON. 3614 Com.—MRS. LOXTON.

Class 336.—*Three Cream Cheeses, made without the use of Rennet.* [15 entries, 3 absent.]

3630 I. (£2.)—THE UNITED CREAMERIES, LTD., Dunragit, Wigtownshire.
3628 II. (£1.)—ALFRED ROWNTREE, Field House, Kirkby Overblow, Leeds.
3626 R. N. & H. C.—MRS. MCINTOSH. 3624 H. C.—CAPT. LAWSON.
Com.—J. & T. CASH, for No. 3620; MAISONNETTE DAIRY CO., LTD., for No. 3627.

CIDER AND PERRY.

Class 337.—*Cask of not less than* 18, *and not more than* 30, *gallons of Cider, made in the Autumn of* 1897. [26 entries, none absent.]

3653 I. (£5.)—W. T. S. TILLEY, East Compton, Shepton Mallet. (Kingston Black, Horner, French Jersey, Red Jersey, and Cadbury.)
3640 II. (£3.)—D. J. CROFTS, Sutton Montis, Sparkford, Bath. (Royal Jersey, White Jersey, Chisel Jersey, White Close Pippin.)
3633 III. (£2.)—W. T. W. ALLEN, Bradley House, West Bradley, Glastonbury. (Red Jersey, Nortons' Bitters and Gins.)
3642 R. N. & H. C.—A. COURTNEY HAYDON. (Mixed Fruit.)
Com.—BRADFORD BROS., for No. 3638; THE SWANLEY CYDER CO., for No. 3649.

Class 338.—*One Dozen Bottles of Cider, made in the Autumn of* 1897. [44 entries, none absent.]

3681 I. (£5.)—DANIEL PHELPS, Tibberton, Gloucester. (Cowarne Red and Fox Whelps.)
3692 II. (£3.)—W. T. S. TILLEY, East Compton, Shepton Mallet. (Jersey, Kingston Black, Horner, and Cadbury.)
3679 III. (£2.)—ARTHUR E. HILL, Egleton Court, Ledbury. (Styre Wilding and Cowarne Red.)
3659 R. N. & H. C.—W. T. W. ALLEN. 3664 H. C.—J. BOSLEY.
Com.—J. BOSLEY, for No. 3663; W. & M. CHAPMAN, for No. 3672; R. ROUT & SON, for No. 3683; J. W. SIMMONS, for No. 3685; THE SWANLEY CYDER CO., for No. 3688; W. T. S. TILLEY, for No. 3693.

Class 339.—*One Dozen Bottles of Cider, made in any year before* 1897. [21 entries, none absent.]

3710 I. (£5.)—DANIEL PHELPS, Tibberton, Gloucester. (Fox Whelp and Skyrme's Kernel.)
3714 II. (£3.)—R. W. SCOTT, East Lambrook Farm, South Petherton, Somerset. (Kingston Black, Dabinet, Chisel Jersey, &c.)

3711 III. (£2.)—R. ROUT & SON, Banham, Attleborough. (Crow's Egg and Russets)
3717 R. N. & H. C.—THE SWANLEY CYDER CO., & H. C. for No. 3716.
3705 Com.—J. BOSLEY.

Class 340.—*One Dozen Bottles of Perry.* [21 entries, 1 absent.]

3729 I. (£5.)—HENRY HARDEMAN, Swan Hotel, Tenbury. (Mixed Fruit.)
3734 II. (£3)—DANIEL PHELPS, Tibberton, Gloucester. (Oldfields.)
3740 III. (£2)—THE SWANLEY CYDER CO., Swanley. (Oldfields and Squash.)
3712 R. N. & H. C.—HENRY THOMSON, Southends, Newent, Glos. (Oldfields)
Com.—J. BOSLEY, for No 3725; J. W. SIMMONS, for No. 3737.

HIVES, HONEY, AND BEE APPLIANCES.[1]

Class 341.—*Collections of Hives and Appliances.* [4 entries, 1 absent.]

3745 I. (£4.)—W. P. MEADOWS, Syston, Leicester.
3747 II. (£2)—G. H. VARTY, Etwall, Derby.
3748 III. (£1.)—E. C. WALTON & Co, Muskham Works, Newark.

Class 342.—*Outfits for Beginners in Bee-keeping.* [8 entries, 1 absent.]

3751 I. (£1.)—T. LANAWAY & SONS, 26 Station Road, Redhill.
3753 II. (15*s.*)—W. P. MEADOWS, Syston, Leicester.
3749 III. (10*s.*)—J. S. GREENHILL, 80 Graham Road, Wimbledon.
3755 R. N. & H. C.—G. H. VARTY, Etwall, Derby.
H. C.—H. HUTCHINGS, for No. 3750; G. H. VARTY, for No. 3756.

Class 343.—*Observatory Hives with Bees and Queen.* [4 entries, 1 absent.]

3760 I. (30*s.*)—T. RICHARDS, Wood Street, Church Gresley, Burton-on-Trent.
3757 II. (20*s.*)—R. BROWN, Flora Apiary, Somersham, Hunts.

Class 344.—*Frame Hives for general use, unpainted.* [8 entries, none absent.]

3765 I. (20*s.*)—W. P. MEADOWS, Syston, Leicester.
3764 II. (15*s.*)—JAMES LEE & SON, 5 Holborn Place, London, W.C.
3762 III. (10*s.*)—J. S. GREENHILL, 80 Graham Road, Wimbledon.
3768 R. N. & H. C.—G. H. VARTY. 3761 H. C.—J. S. GREENHILL.

Class 345.—*Frame Hives for Cottagers' use, unpainted.* [7 entries, none absent.]

3773 I. (20*s.*), & 3772 II. (15*s.*)—W. P. MEADOWS, Syston, Leicester.
3770 III. (10*s.*)—T. LANAWAY & SONS, 26 Station Road, Redhill.
3771 R. N. & H. C.—J. LEE & SON. 3774 H. C.—G. H. VARTY.

Class 346.—*Honey Extractors.*[2] [3 entries.]

3776 I. (15*s.*), 3778 II. (10*s.*), & 3777 R. N. & Com.—W. P. MEADOWS, Syston, Leicester.

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[1] Prizes given by the British Bee-Keepers' Association.
[2] Prizes given by Mr. T. W. Cowan.

Class 347.—*Twelve Sections of Comb Honey, gathered in* 1898. [25 entries, 20 absent.]

3803 I. (15*s*.)—W. WOODLEY, Beedon, Newbury.
3782 II. (10*s*.)—R. BROWN, Flora Apiary, Somersham, Hunts.
3790 III. (5*s*.)—MISS M. L. GAYTON, Much Hadham, Herts.
3800 R. N. & Com.—THE TODDINGTON ORCHARD CO., Winchcombe, Glos.

Class 348.—*Twelve Sections of Comb Honey, gathered before or in* 1897. [4 entries, none absent.]

3805 I. (10*s*.)—F. CHAPMAN, The Dairy, Wells, Somerset.
3807 II. (7*s*. 6*d*.)—W. WOODLEY, Beedon, Newbury.
3806 III. (5*s*.)—W. P. MEADOWS, Syston, Leicester.

Class 349.—*Twelve Sections of Comb Heather Honey, of any year.* [2 entries.]

3809 I. (10*s*.)—THOMAS WALKER, Esthwaite, Hawkshead, Lancs.
3808 II. (7*s*. 6*d*.)—R. W. PATTEN, Rock, Alnwick.

Class 350.—*Three Shallow Frames of Comb Honey, for Extracting, gathered in* 1898. [14 entries, 2 absent.]

3822 I. (10*s*.)—GEORGE WELLS, Eccles, Aylesford, Kent.

Class 351.—*Run or Extracted Light-coloured Honey, gathered in* 1898. [24 entries, 18 absent.]

3843 I. (15*s*.)—ALBERT TWINN, Ridgewell, Halstead.
3830 II. (10*s*.)—MISS S. J. COOPER, St. Nicholas Square, Leicester.
3827 III. (5*s*.)—R. BROWN, Flora Apiary, Somersham, Hunts.
3838 R. N. & H. C.—W. LOVEDAY, Hatfield Heath, Harlow.

Class 352.—*Run or Extracted Dark-coloured Honey, gathered in* 1898. [12 entries, 4 absent.]

3849 I. (15*s*.)—JOHN BERRY, Scotland Street, Llanrwst, N. Wales.
3858 II. (10*s*.)—E. C. R. WHITE, Holbury Mills, Romsey.
3859 III. (5*s*.)—J. H. WOOTTON, Byford, Hereford.

Class 353.—*Run or Extracted Honey, gathered in or before* 1897. [11 entries, none absent.]

3867 I. (10*s*.)—JABEZ SOPP, Crowmarsh, Wallingford.
3870 II. (7*s*. 6*d*.)—W. WOODLEY, Beedon, Newbury.
3865 III. (5*s*.)—P. H. RAWSON, The Brand, Market Drayton.
3862 R. N. & H. C.—THE REV. T. J. EVANS, Tarvin Vicarage, Chester.
H. C.—W. DIXON, for No. 3861; H. RHYS, for No. 3866.

Class 354.—*Run or Extracted Heather Honey, gathered in* 1897 [6 entries, none absent.]

3872 I. (10*s*.)—W. DRINKALL, 54 King Street, Clitheroe.
3876 II. (7*s*. 6*d*.)—THOMAS WALKER, Esthwaite, Hawkshead, Lancs
3874 III. (5*s*.)—W. SPROSTON, Great Haywood, Stafford.
3871 R. N.—J. BERRY, Scotland Street, Llanwrst.

Class 355.—*Granulated Honey, gathered before or in* 1897. [17 entries, 1 absent.]

3893 I. (10*s.*)—W. Woodley, Beedon, Newbury.
3888 II. (7*s.* 6*d.*)—F. Harper, Spiceal Street, Uttoxeter.
3891 III. (5*s.*)—T. Walker, Jun., Blind Ley's Farm, Howden, Yorks.
3878 R. N. & H. C.—R. Brown, Flora Apiary, Somersham.
H. C.—Miss S. J. Cooper, for No. 3879; R. H. Harris, for No. 3884; H. Rhys, for No. 3887.

Class 356.—*Best and most attractive displays of Honey in any form, and of any year.* [4 entries, 2 absent.]

3896 I. (30*s.*)—W. P. Meadows, Syston, Leicester.
3895 II. (20*s.*)—Miss S. J. Cooper, St. Nicholas Square, Leicester.

Class 357.—*Exhibits of not less than 3 lb. of Wax, produced by the Exhibitor's own Bees.* [6 entries, none absent.]

3901 I. (10*s.*)—R. H. Harris, The Conifers, Hambrook, Bristol.
3898 II. (7*s.* 6*d.*)—John Berry, Scotland Street, Llanrwst.
3899 III. (5*s.*)—R. Brown, Flora Apiary, Somersham, Hunts.
3903 R. N.—J. D. Willcox, 5 Merioneth Street, Bedminster, Bristol.

Class 358.—*Any practically useful Inventions connected with Bee-keeping, introduced since* 1896. [11 entries, 2 absent.]

3904 I. (10*s.*)—W. Dixon, 5 Beckett Street, Leeds. New Section Rack with Cleated Separators.
H. C.—W. R. Garner, for No. 3905; J. Lee & Son, for Nos. 3909 & 3911.

Class 359.—*Honey Vinegar.* [2 entries.]

3916 I. (7*s.* 6*d.*), & 3915 II. (5*s.*)—Peter Scattergood, Jun., Prospect Villa, Stapleford, Notts.

Class 360.—*Mead.* [1 entry.]

3917 I. (7*s.* 6*d.*)—T. I. Weston, Great Totham, Essex.

Class 361.—*Most interesting and instructive Exhibits of any kind connected with Bee-culture not mentioned in the foregoing Classes.* [5 entries, none absent.]

3921 I. (10*s.*)—T. I. Weston, Great Totham, Essex. Solar Wax Extractor.
3919 H. C.—R. H. Harris.

IMPLEMENTS.

Self-moving Vehicles.

Class I.—*For Light Loads.* [4 entries, 1 absent.]

4930 I. (£100.)—The Daimler Motor Co., Limited, 219 to 229 Shaftesbury Avenue, London, W.C.: for Daimler Motor Van,

Class II.—*For Heavy Loads.* [5 entries, 3 absent.]

4936 I. (£100)—The Lancashire Steam Motor Co., Leyland, Lancs.: for Waggon to carry 3 tons.
4938 II. (£50.)—The Steam Carriage and Waggon Co., Limited, Homefield, Chiswick.

Methods of Safeguarding Chaff Cutters.

Class III.—*Best Methods of Safeguarding Chaff Cutters.* [17 entries, 1 absent.]

3219 I. (£10.)—Richmond & Chandler, Globe Works, Manchester: for Safeguarding Chaff Cutter, Patent "Multiplex" Safety Feeder.

Silver Medals.

For Articles entered as "New Implements for Agricultural or Estate Purposes."

596 The Monorail Portable Railway Company, 1 Frederick's Place, Old Jewry, London, E.C.: for "Monorail" Portable Railway Plant.
1148 Robert Boby, Limited, Bury St. Edmunds: for Patent Self-Cleaning Machine for Separating Rib or Plantain from Clover.
2033 Vipan & Headly, Church Gate Works, Leicester: for Cream Separator, manufactured by the Centrator Co., Stockholm.
2503 J. & H. Keyworth and Company, 35 Tarleton Street, Liverpool: for Barrow Seed Drill.

HORSE-SHOEING COMPETITIONS.

(Open to the United Kingdom.)

Class 1.—*Hunters.* [38 entries, none absent.]

10 I. (£5.)—T. H. Fathers,[1] Areley Kings, Stourport.
17 II. (£4.)—Walter W. Holdcroft, Park Road, Sutton Coldfield.
20 III. (£3.)—Thomas Kerr, The Hatch Gate, Whitchurch Gate, Reading.
22 IV. (£2.)—Charles Lunn, Fazeley, Tamworth, Staffs.
29 V. (£1.)—William Scholey, Worsborough Dale, Barnsley, Yorks.
32 VI. (£1.)—William Stanton, Castle Street, Luton, Beds.
33 R. N. & H. C.—William Steward, 60 Norfolk Street, Sheffield.
3 H. C.—J. R. Baker, Carnaby, Hull.
8 H. C.—William Dunner, Cock Pit Hill, Cullompton.
34 H. C.—E. T. Tustin, Broad Green, Bromsgrove.
36 H. C.—John R. Webster, 69 Gordon Road, Harborne, Birmingham.

Class 2.—*Dray Horses.* [35 entries, 1 absent.]

47 I. (£5.)—James Frayn, 2 Druckham Cottages, Launceston, Cornwall.
46 II. (£4.)—James Fletcher, Tetford, Horncastle, Lincs.
40 III. (£3.)—William John Bradley, Kelstedge Ashover, Chesterfield.
72 IV. (£2.)—James Pipe Webster, Little Aston, Sutton Coldfield.
73 V. (£1.)—Henry Whitehead, Crofton, Wakefield, Yorks.
54 VI. (£1.)—Edwin Howard, Turf Lea Fold, Marple, Stockport, Cheshire.
53 R. N. & H. C.—William Holmes, Sheldon, Warwickshire.
42 H. C.—James Colley, Lewis Street, Great Bridge, Tipton, Staffs.
56 H. C.—George Jones, The Hendre, Monmouth.
70 H. C.—Eli Dea Ville, Town House, Hanbury, Burton-on-Trent.

[1] Recommended by the Judges for the Freedom of the Worshipful Company of Farriers.

LIST OF CHAMPION PRIZES

AWARDED AT THE BIRMINGHAM MEETING, 1898.

HORSES.

B. G. H. GEE: Hunters' Improvement Society's **Gold Medal** for the best HUNTER Mare or Filly, **Fancy Free** (Class 11, No 122).

SIR WALTER GILBEY, BT.: Hackney Horse Society's **Gold Medal** for the best HACKNEY Stallion, **Gay Danegelt** (Class 22, No. 200).

WALTER WATERHOUSE: Hackney Horse Society's **Gold Medal** for the best HACKNEY Mare or Filly, **Bury Daisy** (Class 26, No. 247).

SIR WALTER GILBEY, BT.: Polo Pony Society's **Gold Medal** for the best POLO PONY Stallion, **Rosewater** (Class 40, No. 367).

SIR H. F. DE TRAFFORD, BT.: Polo Pony Society's **Gold Medal** for the best POLO PONY Mare, **Confidential** (Class 43, No. 380).

ALEXANDER HENDERSON, M.P.: Shire Horse Society's **Gold Medal** for the best SHIRE Stallion, **Buscot Harold** (Class 54, No. 494).

LORD WANTAGE, K.C.B., V.C.: Shire Horse Society's **Gold Medal** for the best SHIRE Mare or Filly, **Hendre Crown Princess** (Class 60, No. 570).

CATTLE.

PHILO L. MILLS: Shorthorn Society's **Gold Medal** for the best SHORTHORN Bull, **Marengo** (Class 79, No. 722).

C. W. BRIERLEY: Shorthorn Society's **Gold Medal** for the best SHORTHORN Cow or Heifer, **Jewel 2nd** (Class 82, No. 813).

THOMAS BROWN & SON: Red Polled Society's **Prize of £10** for the best RED POLLED Bull, **Uncas** (Class 112, No. 1068).

J. J. COLMAN: Red Polled Society's **Prize of £10** for the best RED POLLED Cow or Heifer, **Red Top** (Class 114, No. 1081).

THE EARL OF ROSEBERY, K.G.: Polled Cattle Society's **Gold Medal** for the best ABERDEEN ANGUS Animal, **Edenhall** (Class 117, No 1102).

C. B. MARLAY: Kerry and Dexter Cattle Society's **Prize of £10. 10s.** for the best KERRY Animal, **Marquis** (Class 142, No. 1432).

E. SYDNEY WOODIWISS: Kerry and Dexter Cattle Society's **Prize of £10. 10s.** for the best DEXTER Animal, **Simple Simon** (Class 144, No 1456).

SHEEP.

HENRY DUDDING: Lincoln Long Wool Sheep Breeders' Association's **Prize of £10. 10s.** for the best LINCOLN Ram (Class 161, No. 1590).

DAVID BUTTAR: Shropshire Sheep Flock Book Society's **Gold Medal** for the best SHROPSHIRE Ram (Class 172, No. 1718).

THE EARL OF ELLESMERE: Suffolk Sheep Society's **Gold Medal** for the best SUFFOLK Ram (Class 189, No. 1981).

PIGS.

PHILO L. MILLS: National Pig Breeders' Association's **Gold Medal** for the best LARGE WHITE Boar or Sow, **Ruddington Lad** (Class 214, No. 2132).

A. C. TWENTYMAN: National Pig Breeders' Association's **Gold Medal** for the best MIDDLE WHITE Boar or Sow, **Castlecroft Royal Emperor** (Class 218, No. 2183).

DENSTON GIBSON: National Pig Breeders' Association's **Gold Medal** for the best SMALL WHITE Boar or Sow, **Metchley Fairy** (Class 224, No. 2220).

THE EARL OF CARNARVON: British Berkshire Society's **Prize of £5** for the best BERKSHIRE Boar or Sow (Class 228, No. 2251).

JOHN NORMAN: **Silver Cup**, given by Birmingham Local Committee, and National Pig Breeders' Association's **Gold Medal** for the best TAMWORTH Boar or Sow, **Cliff Crocodile** (Class 232, No. 2302).

MEMORANDA.

ADDRESS OF LETTERS.—All letters on the general business of the Society should be addressed to "The SECRETARY, Royal Agricultural Society of England, 13 Hanover Square, London, W." Letters addressed to officials of the Society by name are liable to be delayed.

TELEGRAMS.—The Society's registered address for telegrams is "Practice, London." *Replies by Telegraph cannot be sent unless paid for in advance, and cannot be guaranteed in any case.*

TELEPHONE NUMBER, 3675, "Gerrard."

OFFICE HOURS.—10 to 4. On Saturdays, 10 to 2.

GENERAL MEETINGS in London: Thursday, December 8, 1898, and Monday, May 29, 1899, at noon, at the Society's house, 13 Hanover Square, W.

MONTHLY COUNCIL (for transaction of business), at noon on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

ADJOURNMENTS.—The Council adjourn over Passion and Easter weeks, when those weeks do not include the first Wednesday of the month; from the first Wednesday in August to the first Wednesday in November; and from the first Wednesday in December to the first Wednesday in February.

SUBSCRIPTIONS.—1. *Annual.*—The subscription of a Governor is £5, and that of a Member £1, due in advance on the 1st of January of each year, and becoming in arrear if unpaid by the 1st of June.

2. *For Life.*—Governors may compound for their subscriptions for future years by paying on election, or at any time thereafter, the sum of £50, and Members by paying £15. Members elected before 1890 may compound at any time on payment of £10 in one sum; and Members elected in or subsequently to 1890 may compound for the same amount after the payment of ten annual subscriptions. Governors and Members who have paid their annual subscription for 20 years or upwards, and whose payments are not in arrear, may compound for future annual subscriptions, that of the current year inclusive, by a single payment of £25 for a Governor, and £5 for a Member. No Governor or Member can be allowed to enter into composition for life until all subscriptions due by him at the time shall have been paid.

No Governor or Member in arrear of his subscription is entitled to any of the privileges of the Society.

All Members belonging to the Society are, under the Bye-laws, bound to pay their annual subscriptions until they shall withdraw from it by notice in writing to the Secretary.

PAYMENTS.—Subscriptions may be paid to the Secretary, either at the office of the Society, No. 13 Hanover Square, London, W., or by means of crossed cheques in favour of the Secretary, or by postal orders, to be obtained at any of the principal post offices throughout the kingdom, and made payable at the Vere Street Office, London, W. When making remittances it should be stated by whom, and on whose account, they are sent. All Cheques and Postal Orders should be crossed "London and Westminster Bank, St. James's Square Branch."

On application to the Secretary, forms may be obtained for authorising the regular payment, by the bankers of individual members, of each annual subscription as it falls due. Members are particularly invited to avail themselves of these Bankers' orders, in order to save trouble both to themselves and to the Society. When payment is made to the London and Westminster Bank, as the Bankers of the Society, it will be desirable that the Secretary should be advised by letter of such payment, in order that the entry in the bankers' book may be at once identified, and the amount posted to the credit of the proper person. No coin can be remitted by post, unless the letter be registered.

JOURNAL.—The Parts of the Society's Journal are (when the subscription is not in arrear) forwarded by post to Members, or delivered from the Society's Office to Members or to the bearer of their written order.

The back numbers of the Journal are kept constantly on sale by the publisher, Mr. JOHN MURRAY, 50A Albemarle Street, W.

NEW MEMBERS.—Every candidate for admission into the Society must be nominated by a Governor or Member, and must duly fill up and sign an application for Membership on the appointed form. Forms of Proposal may be obtained on application to the Secretary. The Secretary will inform new Members of their election by letter.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Proceedings of the Council.

WEDNESDAY, NOVEMBER 2, 1898.

THE EARL OF COVENTRY (PRESIDENT) IN THE CHAIR.

Present:

Trustees.—Earl Egerton of Tatton, Sir Walter Gilbey, Bart., Colonel Sir Nigel Kingscote, K.C.B., the Right Hon. Sir M. W. Ridley, Bart., M.P., Earl Spencer, K.G.

Vice-Presidents. — H.R.H. Prince Christian, K.G., Mr. H. Chandos-Pole-Gell, the Earl of Feversham, Lord Moreton, Sir John Thorold, Bart., Mr. Charles Whitehead.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. George Blake, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. F. S. W. Cornwallis, M.P., Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. A. E. W. Darby, Mr. J. Marshall Dugdale, Mr. S. P. Foster, Mr. W. Frankish, Mr. R. Neville Grenville, Mr. James Hornsby, Capt. W. S. B. Levett, Mr. C. S. Mainwaring, Mr. Henry D. Marshall, Mr. Joseph Martin, the Hon. Cecil T. Parker, Mr. A. E. Pease, M.P., Mr. Albert Pell, Mr. Dan Pidgeon, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. S. Rowlandson, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. A. J. Smith, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. R. Stratton, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Sir Jacob Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. W. Carruthers, F.R.S., Consulting Botanist; Mr. J. E. Compton-Bracebridge, Assistant Director; Mr. R. S. Burgess, Superintendent of the Showyard.

Professor Sir George Brown, C.B.

Mr. R. A. Hamilton Seymour, Secretary of the Maidstone Local Committee.

Apologies for non-attendance were received from Earl Cawdor, Mr. Victor C. W. Cavendish, M.P., Mr. Martin J. Sutton, and Professor J. B. Simonds.

Death of Mr. W. T. Scarth.

The PRESIDENT, at the commencement of the proceedings, said it was his painful duty to announce the death, during the recess, of their esteemed colleage, Mr. W. T. Scarth. The circumstances under which Mr. Scarth died were probably known to them all, and lent a peculiar pathos to the end of a long and useful agricultural career. Mr. Scarth's connection with the Society commenced in 1845, when he was elected a member, and he joined the Council in 1886. He (the President) was sure they all deplored the loss of a genial and esteemed colleague.

Election of New Members.

The minutes of the last ordinary meeting of the Council, held on July 27, 1898, having been taken as read and approved, the election of the following thirty-one members was proceeded with:—

BRIGGS, L. F., Priory Farm, Stamford.
BURDETT, Sir Francis, Bart., Foremark Hall, Burton-on-Trent.
BURY, R. E., St. Leonard's, Nazeing.
CAIRNES, A. T., The Glen, Drogheda.

COMPTON, Rev. Prebendary Berdmore, M.A... Atherstone Hall, Warwickshire.
DURRANT, John B...Saxmundham.
FAIL, R. W...Nedderton, Newcastle-on-Tyne.
FAUCHON, J...Boxley, Maidstone.
FROOD, H...Combs, Chapel-en-le-Frith.
GAISFORD, J. C...Offington, Worthing.
GARLAND, John C...Wolvers, Reigate.
GEORGE, Isaac..Mountain Ash, Glam.
*GODFREY, Ernest H...38A Earlsfield Rd., S.W.
GRIMSEY, J. R...St. Helens, Dunwich, Saxmundham.
HILLINGDON, Lord..Hillingdon Ct., Uxbridge.
HOYLE, Edward..Moorlands, Bacup.
JESSOPP, A. L...Leasingham, Sleaford.
LAW, J...Adwick Grange, Doncaster.
LLEWELLIN, R. L. Purcell..Underhill Hall, Pulverbatch, Shrewsbury.
MARCHANT, W...Matfield Ho., Paddock Wood.
MERKING, H. F...Richings Park, Colnbrook.
PAULL, H. B...Tehidy Office, Camborne.
PEASE, H. Pike, M.P...Undercliffe, Great Ayton.
PEMBERTON, E. G...Fyning House, Petersfield.
POLENGHI, Paolo..Burstow, Horley, Surrey.
ROBINSON, S. A...Botesdale, Diss.
ROWCLIFFE, E. L...Cranleigh, Guildford.
SOAMES, Rev. H. A...Otford, Sevenoaks.
SOLE, A...Elbridge, Sturry, Canterbury.
VALLENTINE, George..Burcott Lodge Farm, Wing, Leighton Buzzard.
WALKER, Arthur E...Great Yarmouth.

* Life Membership conferred by the Council.

Finance.

Sir NIGEL KINGSCOTE (Chairman) reported that the accounts for the period ended October 29, 1898, as certified by the Society's Accountants, showed total receipts amounting to 11,404*l.* 18*s.* 9*d.*, and expenditure to 15,481*l.* 5*s.* 5*d.* The actual balance at the bank on October 29 last, allowing for cheques outstanding, was 816*l.* 18*s.* 4*d.* Accounts amounting in all to 838*l.* 6*s.* 8*d.* had been passed, and were recommended for payment. The quarterly statement of subscriptions, arrears, and property to September 30, 1898, had been laid upon the table.

A letter had been received from Mr. Ernest H. Godfrey, resigning his post on the Society's official staff in consequence of his appointment as Secretary of the Central Chamber of Agriculture. The Committee thought it right to place on record their sense of Mr. Godfrey's efficient and faithful services to the Society during the eleven years that he had been in its employment, and they recommended that a Life Membership of the Society be presented to him in recognition of the Council's appreciation of those services.

House.

Sir NIGEL KINGSCOTE (Chairman) reported that the Society's house had been cleaned and redecorated during the recess.

Journal.

Sir JOHN THOROLD (Chairman) reported the publication on September 30 of Part III. of the Journal for the current year, which had been duly issued to the Governors and Members, and of the Society's new pamphlet on "The Mare and Foal." The Committee had discussed the arrangements proposed for the next number of the Journal, and had given directions as to a variety of suggested articles and notes.

Chemical and Woburn.

Mr. WARREN stated that the Consulting Chemist had submitted a report upon the experiments conducted during the present year both in the field and at the pot culture station at Woburn. He had also exhibited photographs taken during the progress of the experiments, which the Committee thought might lead to important results. These included experiments under the Hills bequest. Owing to the prolonged drought the Consulting Chemist had only been able to visit one site, in addition to those already reported on, for the Society's grass experiments during the past recess. The Committee gave notice that at their next meeting they would move for the renewal for 1899 of their annual grants of (1) 200*l.* towards the cost of the Pot Culture Station, and (2) 100*l.* for Grass Experiments.

The Consulting Chemist had presented the following report, which the Committee recommended for publication with the proceedings of the Council:—

Report of Consulting Chemist.

MATERIALS SOLD FOR DRESSING WHEAT AGAINST SMUT.—In consequence of the prevalence, in some districts, of smut in wheat during the past few years, more attention has been directed of late to the dressing or steeping of wheat seed before sowing. There is reason to believe that, in addition to several recognised materials employed effectually for this purpose, the commonest being perhaps sulphate of copper (known variably under the names "bluestone" and "blue

vitriol"), there are other materials of little, or at least doubtful, value, which the farmer, if not careful, may find thrust upon him. One such case was recently brought to my notice. A very large farmer and extensive wheat grower sent me two samples of materials sold to him as "wheat dressing," and which he had been using. Both of these were bright in colour. The one was found to be genuine blue vitriol (sulphate of copper), but the other showed, on analysis, the following composition :—

Sulphate of iron	98·75
Prussian blue	1·06
Sand	·19
	100·00

This was merely sulphate of iron coloured blue with Prussian blue, so as to make it look like sulphate of copper, the purchaser no doubt thinking that he was getting the latter, the appearance of which was familiar to him. On making further inquiry I found that this mixture was sold under the following description: "Finely-ground vitriol, specially prepared as a dressing for wheat." The price paid was 28*s*. per cwt., that of sulphate of iron being about 4*s*. per cwt., while sulphate of copper would cost about 20*s*. per cwt. Unfortunately, inasmuch as the general term "vitriol" is applicable alike to sulphate of copper and sulphate of iron (the former being "blue vitriol" and the latter "green vitriol"), it is doubtful what remedy a purchaser would have, but that the second preparation was a "colourable imitation" of sulphate of copper is clear, and so it is well to put farmers on their guard against such.

COFFEE HUSKS.—In a former Report (April, 1898 [1]) mention was made by me that I had found as a constituent of certain compound cakes a worthless material, the husks or "parchment" skin of coffee berries. More recently I have had a sample of the material sold by itself as a feeding stuff. The information I had about this worthless substance was to the effect that it could be obtained, delivered to the nearest station, for about 1*l*. per ton.

FOREIGN LINSEED CAKE CONTAINING ROPE, MUSTARD, &c.—I was recently called upon to investigate a case where one bullock had died, and others had been ill, from inflammation of the bowels, the cake used being believed to be the cause. Of two kinds of cake sent, one—decorticated cotton cake—was found to be quite good, but the other, which had been purchased as "Indian Oil Cake," was far otherwise. In the first place the cake had not only on the outside, but even running through the cake itself, quite a quantity of strings of coarse rope. To make sure that the occurrence was not accidental to the piece sent me, I had others forwarded, and one and all had this rope distributed over and through them. Cattle feeding on the cake must have taken a not inconsiderable amount of rope into their interior. The rope no doubt was derived from the coarse sacking which had been used in the pressing of the cake to remove the oil. Added to this, the cake had quite a pungent taste, and microscopical examination confirmed the presence of mustard seed as an impurity.

BONE MEAL CONTAINING BOILED BONE.—A sample was sent me for analysis of what had been purchased as "bone meal," under a guarantee of 45 to 48 per cent. phosphate of lime and $4\frac{1}{2}$ to 5 per cent. of ammonia. Analysis of it showed :—

Moisture	8·06
*Organic matter	29·91
Phosphate of lime	48·72
Carbonate of lime, &c.	10·04
Sand	3·24
	100·00
* Containing nitrogen	3·94
Equal to ammonia	4·78

From these figures one might conclude that the guarantee had been satisfied, and certainly, so far as figures go, the analysis is a good representative one of genuine raw bone meal. And yet, on examining the sample, I could not avoid forming the opinion that it contained some boiled bone, and was not all raw bone meal. In addition, it was what one would call a very "meaty" sample, having a good deal of the dried flesh adhering to the bone. I picked out what seemed to me the most suspicious pieces, and on analysing the bone portions found that they gave—

Nitrogen	1·23 per cent.
Equal to ammonia	1·49 per cent.

This was clearly boiled bone, as raw bone would have given about $4\frac{1}{2}$ per cent. of ammonia. The meaty portions gave :—

Nitrogen	6·66
Equal to ammonia	8·08

Obviously then the analysis came out as it did, not because of the sample being all genuine raw bone meal, but because of the boiled bone and the meat which occurred along with the raw bone balancing one another analytically. Such a sample ought not, I think, to be called "bone meal."

(Signed) J. AUGUSTUS VOELCKER.

October 31, 1898.

Experiments at Pot-culture Station.

Earl SPENCER said that nothing was more important in the work of the Society than the scientific experiments carried on at Woburn, and the experiments in pot-culture had been demonstrated in a most interesting manner by means of the series of photographs which they had just seen in the other room. He could not conceive anything more beneficial to agriculture than the dissemination of information of this kind. He would like to know whether it was proposed to circulate it in any way. He considered that these photographs would be of great in-

[1] See page xlvii.

terest in the agricultural department of the Paris Exhibition. They all learned a great deal from reading, but he thought that the most instructive teaching was through the eye, such as that which they obtained by means of the pictures they had seen that day. A great deal of importance was attached to the work of the Society, and the more this work was known throughout the country the better it would be for the interests of agriculture.

Mr. PELL thought there was great value in the observation of experiments by means of these photographs, especially when they considered that the laboratory was no longer at hand for the benefit of those who might like to watch their progress, without making a journey to Woburn for the purpose. These chemical investigations, which had been begun by Sir Humphry Davy, were of great interest, and if the Society would in the course of time have these photographs exhibited in some way, they would be extremely valuable to members.

Lord EGERTON OF TATTON suggested that the photographs should be reproduced in the Journal, as it would be scarcely sufficient to place them in the Society's house, where they would be seen by comparatively few people. He remembered an exhibition abroad where a very interesting series of roots of plants was illustrated in this way, and if a number of the photographs could be sent to the Paris Exhibition, they would be a very useful and instructive exhibit.

Sir JOHN THOROLD said that the Journal Committee would take into consideration the question of publishing the photographs in the Journal, as suggested.

Botanical and Zoological.

Mr. WHITEHEAD (Chairman) reported that in accordance with instructions given at the last meeting, a circular had been sent to the Members of the Council and officers of the Society with regard to the proposed collection of recognised varieties of grain. The Consulting Botanist had given particulars of the replies received in response to these circulars, and stated that it would be advisable to re-issue the circular before the harvest of 1899, as the specimens received could not be considered as sufficient to form a representative collection. During the past recess thirty-one applications had been received and attended to by the Consulting Botanist. The majority had been inquiries as to the names and properties of weeds, and the best way to get rid of them. Nine cases of fungal attacks on cultivated plants—wheat, grass, turnip, hop, and apple tree—had been investigated and reported upon.

The following report had been presented by the Zoologist:—

Report of Zoologist.

As, notwithstanding a great deal of correspondence, no advance seemed to be made towards the determination of the new apple pest recorded last year, I found it necessary to personally investigate the matter in Devonshire. I visited several orchards, and though the peculiar infestation was much less noticeable this year, I was able to find some examples of the attack and to recognise the insect at work. It proved to be the caterpillar of a small Tineid moth, and therefore not the dreaded "Apple Maggot" of the United States. This is very reassuring, for though it is a new pest to this country, there is yet no reason to apprehend any very extensive injury from its presence. Its borings in the fruit precisely resemble those of the apple maggot in its early stages, as they are narrow galleries which riddle the whole substance of the apple. In British Columbia a Tineid moth, with similar habits, has recently been described. Its injury was first attributed to the apple maggot, but the caterpillars were found at work, and a moth bred out from one of them was identified by Lord Walsingham as *Argyresthia conjugella*, an insect which in this country attacks the berries of the mountain ash. The Devonshire pest, in its larval state does not agree with the description of the caterpillar of *A. conjugella* though it is probably an *Argyresthia*. It is hoped that specimens may be safely reared, and the species determined with certainty.

On October 7, Mr. Martin Sutton asked me to inspect a very severe attack of green fly on swedes in the neighbourhood of Dorchester, Oxon. I went over on October 11, and Mr. T. Latham kindly drove me to the fields where the infestation was at its worst. Some hundreds of acres of swedes had their leafage entirely destroyed, and gave forth a very offensive smell. Cabbages were badly attacked and there was a good deal of aphis on English turnips, but these crops did not succumb to the same extent. Mangels were entirely free. The insect at work was *Aphis brassicae*, the cabbage and swede green fly.

Of course the prolonged drought was largely answerable for the condition of the crops, and the green fly, with its tremendous powers of multiplication, had found the weakened plants an easy prey. Some amelioration has taken place since the advent of rain. There are two points with

regard to the attack which it is well to mention in the present report: (*a*) These insects are phenomenally rapid in their rate of increase, and therefore it is especially necessary to combat the attack at the outset. A kerosene emulsion, applied by a Strawsoniser as soon as the lice were noticed, would have been very beneficial. (*b*) The pest usually migrates to the crops from weeds allied to the turnip tribe, upon which they live in the early summer. It is therefore very important to keep down all cruciferous weeds, such as "Charlock" and "Shepherd's Purse."

(Signed) CECIL WARBURTON.

October 31, 1898.

Veterinary.

The Hon. CECIL PARKER (Chairman) presented the following report by Professor McFadyean:—

ANTHRAX.—The published returns of the Board of Agriculture show a considerable increase in the prevalence of this disease for the current year. The outbreaks already notified (forty-three weeks) number 462, with 699 animals attacked, being an increase of 99 outbreaks and 89 animals attacked, as compared with the same period of 1897.

GLANDERS.—During the forty-three weeks of this year, for which returns have already been issued, the outbreaks numbered 630, comprising 1,172 cases of the disease. During the same period of last year the figures were respectively 752 and 1,294.

RABIES.—This disease appears to be on the point of extermination, only 2 cases having been detected since July last. These were in dogs, and occurred in the county of Lancaster. The total number of cases notified during the current year is 16 (all in dogs), as compared with 137 cases in dogs and 14 in other animals in the corresponding period of 1897.

SWINE FEVER.—The total outbreaks reported for the present year number 2,123, being an increase of 162 over the outbreaks for the same period of last year. The number of pigs slaughtered as diseased or suspected during the present year is 36,735, as against 25,892 for the same period of last year.

MISCELLANEOUS.—During the past quarter specimens from 46 cases of disease were sent to the Research Laboratory at the Royal Veterinary College for examination. These comprised cases of anthrax, tuberculosis, glanders, swine erysipelas, mange, tumours, &c. During the same period an outbreak of cow-pox was locally investigated.

No reply having yet been received to the President's letter of July 27th last, on the subject of Cubic Air Space in Cow Byres, the Committee recommended that a further communication, pressing for a reply, be sent to the President of the Local Government Board. More letters on the subject had been received during the recess.

Consideration had been given to the proposals of the Principal of the Royal Veterinary College for the reduction of the fees payable by members of the Society for the examination of the viscera of poisoned animals, and it had been arranged that the following schedule should replace that at present in force:—

	£	s.	d.
1. Personal consultation with a veterinary professor	0	10	6
2. Consultation by letter . . .	0	10	6
3. Post-mortem examination of an animal, and report thereon .	1	1	0
4. Chemical examination of viscera for any specified metallic poison	0	10	6
5. Chemical examination of viscera for all metallic poisons . .	1	0	0
6. Chemical examination of viscera for all vegetable poisons . .	1	0	0
7. Chemical examination of viscera, complete, for metals and alkaloids	2	0	0

(The above fees do not apply to cases which involve a visit to the locality).

The Committee recommended that the Horse-shoeing Competition at Maidstone be divided into two classes—Class I. for light horses, and Class II. for heavy horses. They gave notice that at their next meeting they would move for the renewal of their annual grant of 600*l*., of which 500*l*. to be allocated to the Royal Veterinary College, and 100*l*. reserved for general purposes.

Tuberculosis and Compensation.

Mr. STRATTON said he would like to ask whether the Veterinary Committee did not think it was nearly time to take into consideration the question of a resolution by the Council asking the Government to compensate in cases of animals confiscated for tuberculosis. The effect of the law as it now stood was that the butcher who purchased these animals in the market was frequently mulcted in a heavy loss, and the effect was to depress the trade in home-grown beef to the advantage of the foreigner. This was a very important matter, and he thought they ought to ask the Committee very seriously to consider whether some resolution should not be passed by the Council. Such a resolution would have great influence.

Increase of Swine Fever.

Mr. NEVILLE GRENVILLE, referring to the increase in the outbreaks of

swine fever, said there was a great feeling in the county of Somerset that so long as compensation was paid, so long would there be swine fever. No doubt this brought a certain amount of Government money into the county, but still it was a serious matter, as the disease appeared to go on increasing.

The PRESIDENT stated that the points raised would receive the attention of the Veterinary Committee at their next meeting.

Stock Prizes.

Mr. SANDAY (Chairman) reported that of the prize sows entered as "in pig" at the Birmingham Meeting the following had become ineligible owing to non-compliance with the regulations as to farrowing:—

Class 216.

No. 2,164.—First Prize to Mr. Philo L. Mills, for "Miss Hollingsworth LIX."

Class 220.

No. 2,199.—Third Prize to Mr. Sanders Spencer, for "Holywell Middlesborough."

Class 224.

No. 2,217.—Second Prize to The Hon. D. P. Bouverie.

The Committee recommended, therefore, that the awards in these classes be altered as follows:—

Class 216.

No. 2,163.—First Prize of 10*l*. to Mr. Philo L. Mills, for "Miss Hollingsworth LIV." (*Second Prize*).

No. 2,162.—Second Prize of 5*l*. to Sir Gilbert Greenall, Bart., for "Walton Sunflower" (*Third Prize*).

No. 2,167.—Third Prize of 3*l*. to Mr. Sanders Spencer, for "Holywell Model" (*Reserve Number*).

Class 220.

No. 2,196.—Third Prize of 3*l*. to Sir Gilbert Greenall, Bart., for "Walton Daisy II." (*Reserve Number*).

Class 224.

No. 2,219.—Second Prize of 5*l*. to Mr. Denston Gibson, for "Metchley Dot" (*Third Prize*).

Class 216.

No. 2,218.—Third Prize of 3*l*. to The Hon. D. P. Bouverie (*Reserve Number*).

The draft prize-sheet for the Maidstone Meeting had been prepared, and the Committee proposed to bring up a formal motion for its adoption at their next meeting in December. The Committee recommended that yearling bulls be exempted from the regulation as to the use of leading-sticks, and that the date for sheep-shearing, with the exception of the Blackfaced Mountain, Cheviot, and Herdwick breeds, be altered to March 1st.

They also recommended the acceptance, with thanks, of the following offers of champion prizes:—

HUNTERS' IMPROVEMENT SOCIETY.—A gold medal for the best Hunter filly.

HACKNEY HORSE SOCIETY.—Two gold medals for the best Hackney stallion and the best Hackney mare or filly.

POLO PONY SOCIETY.—Two gold medals for the best Polo Pony Stallion and for the best Polo Pony mare.

SHIRE HORSE SOCIETY.—Two gold medals for the best Shire stallion and the best Shire mare.

POLLED CATTLE SOCIETY.—A gold medal for the best Aberdeen-Angus animal.

KERRY AND DEXTER CATTLE SOCIETY.—A prize, value 20 gs., for the best Kerry animal, and a cup, value 25 gs., for the best Dexter animal.

SOUTHDOWN SHEEP SOCIETY.—A prize of 10 gs. for the best Southdown two-shear or shearling ram.

SUFFOLK SHEEP SOCIETY.—A gold medal for the best Suffolk two-shear or shearling ram.

The Docking of Horses.

Sir NIGEL KINGSCOTE, pursuant to notice, moved the following resolution:—

That at and after the Maidstone Meeting of 1899, no foals with docked tails be allowed to be exhibited at the Society's Country Meetings; that at and after the Meeting of 1900, the same rule shall apply to yearlings as well as foals; and that at and after the Meeting of 1901, to two-year-olds also.

He said he felt he had no occasion to apologise to the Council for bringing the matter of the docking of horses before them again, as to his mind the cause he espoused had become a hundredfold more needful since the matter was last before the Council in 1892.[1] He gave to the Secretary the notice which he had put upon the paper immediately after the Meeting at Four Oaks Park, where he was shocked and disgusted to see the extent to which docking had been carried, not only with the aged and young horses, but with the foals also, spoiling altogether, to his mind, the best exhibit of horses he had ever seen at a "Royal" show. At the beginning of the month he received

[1] See Journal, Vol. III., 1892, 3rd series, pp. lxxxi., xcii. and clxxv.

from the author a copy, in pamphlet form, of "The Wanton Mutilation of Animals," by Dr. Fleming; in reality, a republication of an article in the *Nineteenth Century* of March, 1895. Having had a number of copies of Dr. Fleming's pamphlet placed at his disposal, he had ventured to send one to each member of Council, as the question was so clearly and forcibly dealt with, and the cruelty and undesirability of the system of docking so fully exposed in the pamphlet, that he felt it would be a better argument for his case than any words of his own, and would moreover save the Council's time. They would remember that in November 1892 a similar resolution to that which he now moved was brought before the Council by the Duke of Westminster, seconded by himself. He regretted, and had ever since regretted, that the motion was rejected.

The evil and cruelty of docking had become worse since that time. He could only reiterate what he then stated, and what was still his own opinion, that the cruelty was not only in the operation (an operation which at any age of the animal should always be performed by a duly qualified veterinary surgeon, not by an ignorant groom or blacksmith), but in an intensified degree when the poor docked animal was turned out into the fields, whether as a brood mare or in any other condition. The hair might grow on the stump, but it fell listlessly down, and could not be used to swish off flies and insects. Surely this great and leading Society should no longer lend itself to the cruel and disfiguring fashion of docking. The Hunters' Improvement Society had led the way, for it passed in May 1897 a resolution that at its 1899 show all yearlings should be exhibited undocked, and it was proposed to extend that prohibition to two-year-olds and three-year-olds. In America and Canada docking was not tolerated. In the latter country the law prohibited it, and he was not sure that it was not equally illegal in this country; for Sir James Ingham had stated that docking, except when performed to cure disease, was a cruel operation, and within the decision of the Supreme Court of Judicature (Murphy *v.* Manning), to the effect that it was an offence under 12 and 13 Vic., ch. 92, cruelly to mutilate animals for the purpose of conforming to the customs of fashion.

He would, therefore, appeal to the Council to support and carry his motion, which he had framed more mildly than he should have wished, so as not to affect existing interests, *i.e.* not to interfere with those animals already born which exhibitors might desire to show. But he should fain hope that in the future this Society might go even further, and not allow any horse under four years old to be shown with its tail docked. This would still permit those persons who wished to drive docked horses to show them in harness at and after four years old, and it would not interfere with the exhibitors who might like to spoil, by docking, the looks of their animals, whether hunters, hacks, carriage horses, or ponies, and in many cases deteriorate their value by making them worthless for use in the army or exportation to America, Canada, or other foreign countries. He had heard it said that his motion would have the effect of stopping the docking of horses altogether. This was not the case. His motion did not interfere at all with the liberty of the subject. Owners might dock their horses as much as they pleased. All he argued was that this Society ought not to give prizes for young animals under three years old which had been unnecessarily docked in order to comply with a cruel and senseless fashion. He could use other arguments equally strong, but would detain the Council no longer; only pressing as ardently as he could that this regulation was one that the Society should adopt, not only for its own credit, but also on behalf of the noble animal in whose exhibition it took so great an interest.

H.R.H. Prince CHRISTIAN, in seconding the motion, said he felt it was only necessary to do so in a very few words after the able speech to which they had all listened with so much interest. He entirely concurred in every word Sir Nigel Kingscote had said. Furthermore, the weighty arguments put forward by so great an authority as Dr. Fleming, in the pamphlet which was in the hands of most of the gentlemen present, were

most convincing. It was stated that docking increased the market value of a horse. He confessed that, to his mind, it was the very reverse, and that a horse decidedly lost a great deal of his value by undergoing this unnecessary and, in his opinion, disfiguring operation. He only wished that the seconding of this motion had been placed in abler hands; but he felt so strongly on the subject that he himself ventured to offer to second the motion. He hoped that the Council of the Royal Agricultural Society would pass the resolution by a large majority, as he could not understand why, in a horse-loving country like England, they should ever tolerate so cruel a practice.

Mr. ASHWORTH was sorry to take up a position in opposition to the proposals brought forward by Sir Nigel Kingscote, but he could not help thinking that Sir Nigel and H.R.H. Prince Christian, who had so ably seconded the motion, were acting out of the kindness of their hearts. The question had twice before been submitted to the Council, and had twice been rejected. He hoped it would be rejected yet a third time. The utility and safety of the practice of docking horses' tails had recently only too painfully been demonstrated by the sad and terrible accident which happened to Lady Lathom, who was driving a long-tailed horse in a phaeton, when the reins got under the horse's tail, and all control over the animal was lost. With regard to the cruelty of the custom, he had seen foals docked while feeding at the manger, and they had not so much as turned their heads round, so that the operation must have been perfectly painless. If it was cruel to dock foals' tails, why should the tails of sheep and lambs be docked, or why should the practice of gelding horses be continued? If one practice was cruel, so were the others. He thought that by adopting this resolution the Council, instead of safeguarding the interests of breeders, would be doing them an injury. The docking of horses' tails was undoubtedly a fashion, and he thought therefore that the Council would be going outside its province in endeavouring to combat it. If they insisted on this, they would be inflicting an injury upon the already depressed industry of horse-breeding. There were some people who would not eat lobster sauce because lobsters were killed in a cruel way, but that was no reason why others who had no such scruples should not eat lobster sauce, without being subjected to dictation on the point. He hoped the Royal Agricultural Society would not adopt this resolution, the scope of which was quite beyond its province, and which would gravely affect the sale of horses in this country.

Mr. HORNSBY thought it his duty, as having represented the interests of members in the counties of Lincoln, Leicester, and Northampton, to oppose this motion. It would be a very great loss to agriculturists if the resolution were passed. There were certain horses bred in the county of Northampton from strong mares served by thoroughbred horses. If they were taken to Melton for sale with their tails undocked, no one would buy them, whereas if they were docked they fetched 200*l*., 300*l*., or 400*l*. apiece. To farmers who docked their animals in view of the present prices obtained for docked animals, the passing of this resolution would do harm, for the markets were practically closed to hunters with long tails.

Mr. FOSTER asked whether it was not more cruel to dock a horse at four years old than to do so when it was a few weeks old.

Sir WALTER GILBEY was very sorry to oppose the motion, but he felt that if it were passed by the Council it would very much decrease the breeding of horses in this country. The subject of breeding more horses was taken up by the Government in 1873, and a Select Committee of the House of Lords, with Lord Rosebery as Chairman, was appointed. Since then there had been much correspondence in the public press. Societies had been established especially in the interests of horse-breeding, and Lord Cathcart had, at the request of the Journal Committee, dealt with the question in an article which appeared in the Society's Journal in 1883; and he undertook this task on account of the

deficient horse supply and the necessity of the Government having to send abroad to buy horses for the Army. There had been great depression for more than fifty years in the horse-breeding industry. The various societies that had taken the subject up did not appear to increase the supply, for he still noticed in the Government Returns that the only live stock in which they were deficient in England were horses. A very large proportion of the carriage horses in London were imported from abroad. He would not take up the question of cruelty either of docking or gelding. He did not think it was in the province of the Council to pass the resolution before the meeting, and he was sorry to learn that the Hunters' Improvement Society had taken such a step—he did not think they would derive much benefit from it. He thought the fashion might be allowed to die out of itself, as other fashions had done before it. Racehorses were docked at one time, and cropping of horses' ears was in regular practice, but that custom had died out long ago. If the resolution were passed it would do an immense amount of harm to the breeders of horses of this country, and it would not prove for the benefit of the Royal Agricultural Society of England.

Earl SPENCER said he was very sorry to oppose so great a promoter of horse-breeding as Sir Walter Gilbey, but he confessed that for many years he had had a very strong opinion on this subject of docking. He could not agree with the views of his friend, Mr. Hornsby, and, as having been in the county of Northampton much longer than Mr. Hornsby, he strongly supported the proposals made by Sir Nigel Kingscote and His Royal Highness. If they went into the question of cruelty, there were many other things to be considered. He maintained that the inconvenience of having a long-tailed horse instead of a short-tailed one was very little. Mr. Ashworth appeared to think that docking a foal was a tonic for his appetite. (Laughter.) He maintained, with regard to the question of docking horses, that very little difficulty arose. Probably it might arise in some small degree from the construction of carriages; but he went so far as to say that it would be better to alter the carriages rather than keep short tails. As to affecting the supply of the country, he could not believe that in the least. Would they say that because they made a better-looking animal, and one more in accordance with nature, that they would drive the people who bought horses from the country? He could not allow that for a moment. It was entirely a question of fashion. In old days it was the fashion to crop horses' ears, and it was a singular thing with regard to this question of horses' tails that the horse which they considered the pride of England, viz. the racehorse, always had the longest tail possible. Where they required to diminish weight they still kept the tail. He was very glad to think they did so. With respect to hunters, there was no doubt in his mind that it was an enormous addition to the beauty of a horse to have a good tail; and he went so far as to say that the docking of a horse was prejudicial to its power of turning. He had had horses, and he had one now—a hackney—with a very short dock. He had bought him with a dock, and he had had to dock him again. They were obliged in his part of the country to have horses very quick at turning, and he (Lord Spencer) could not screw that particular horse round to open a gate. This was due to the docked tail. The greatest discomfort and cruelty to a horse was its being deprived of the power of whisking away flies while in the field. The system of leaving foals and breeding mares with a miserable pretence of a tail was barbarous, and he might almost say indecent. He most earnestly hoped that the Royal Agricultural Society would show an example in this respect, and try to point out that there were at all events a certain number of people in this country who did not think it necessary to disfigure their horses. He trusted that the example which the Council proposed to make would be followed elsewhere. It was only a question of fashion. The resolution proposed to

make the change in a most considerate way. It would only affect young horses, and he hoped that by the time three or four years had passed the eyes of people generally would get cultivated to appreciate the beauty of a long-tailed horse instead of a short one.

Earl EGERTON OF TATTON said he felt bound to give his opinion of this question. He had been in India, where all horses were undocked, and in that country he had had a very severe accident through the horse getting the reins under its tail. He thought it all depended upon how they looked at the question. They were obliged to have undocked horses for chargers and state horses, and such horses in vehicles with a high box were perfectly safe. But directly they came to the smaller sorts of carriage—*i.e.* such as the dog-cart, pony-carriage, phaeton—it was absolutely unsafe to drive a long-tailed animal. If they adopted Sir Nigel's motion they would not be followed by the country. So long as there was a demand for such horses, they would be provided for the market. It was quite true that they would not have a short-tailed horse in a barouche or state carriage; but as an agricultural society they had to provide for the majority of horses, and they had to deal with the commercial animal used for driving purposes. To pass a resolution of this kind would stultify them in the country, because it would not be supported by popular opinion. If everybody drove a barouche or a four-in-hand, it would be a different matter. He therefore ventured to think that the Council of the Royal Agricultural Society would not be well-advised to pass a resolution of the kind proposed. As shown in the book to which Sir Nigel Kingscote had referred, military people looked very well indeed on a long-tailed horse, but short-tailed horses did not look well for riding. He thought that a modified form of docking was better. He always docked horses when quite foals, and with a very moderate dock indeed—sufficiently short not to be dangerous to drivers. He ventured to think that that should be the opinion of the Society.

Mr. TERRY said he thought the resolution—which he could not support—was advancing too rapidly. As to the question of cruelty, he would like to see the law made clearer, so that it might be made illegal to dock a horse when more than six months old. That would meet the case to a great extent. It should not be any part of the business of the Society to interfere with the privileges of members of having their horses docked or undocked.

Mr. CHANDOS-POLE-GELL said he had only had to dock three aged horses, and these were cases of necessity. With regard to the cutting of foals' tails, he had never seen a foal with a tail long enough to knock off flies.

Sir NIGEL KINGSCOTE, in reply to the arguments which had been advanced against his motion, said that Mr Ashworth appeared to think that this matter had been brought forward out of "kindness of heart," without regard to the interests of breeders. On the contrary, he had shown that by docking their horses they excluded three sources of demand, viz. horses for the Army, for the United States, and Canada. His friend Mr. Hornsby said the Government ought to change, and buy short-tailed, docked horses, but he would like Mr. Hornsby to go on a hot summer's day and look at a troop of cavalry tethered if the horses had docked tails. That would be about as great an act of cruelty as anything they could conceive. With regard to the question as to whether it was not more cruel to dock a four-year-old horse, he did not believe that if the operation were performed by a properly qualified veterinary surgeon a horse would feel it more than a foal would. Mr. Pole-Gell thought that foals' tails were too short to be of use in keeping off flies, but he would remind him that the cruelty came when these animals had grown, and without tails had no power of swishing off flies. The fact was that the practice was a silly fashion. He remembered that from the years 1850 to 1875 or 1880 everybody drove horses with much longer tails, and no more accidents occurred then than now. Moreover, in his experience, a docked horse with his

tail over the reins held them much more tightly than a long-tailed horse. He was not alone in his desire that this question should be seriously taken in hand by the Council, and since his notice of motion was given he had had a great many letters in support of it from influential members of the Council and others, including his friend, Mr. Walter Long, the President of the Board of Agriculture. Their old friend, Professor Simonds, whose long professional experience was entitled to great weight, cordially supported his views. Lovers and breeders of the horse so well known as the Duke of Westminster, the Earl of Derby, and Mr. Victor Cavendish were all in favour of his resolution, and the Duke summed up, he thought, the situation very well when he said in a letter, from which he would venture to quote: "The body of a horse is endowed by Nature with a head at one end and a tail at the other, balancing each other, both having their obvious uses. Remove one, and you produce a monstrosity, and inflict chronic cruelty. Docking in itself is a small thing, but its effect, in removing protection against flies in summer, in deference to an absurd and hideous fashion, is simply torture to the animal so treated, and ought not to receive the sanction of the Council." He now left the question with confidence in the hands of the Council.

The PRESIDENT remarked that it would not be necessary for him to say much concerning the motion of Sir Nigel Kingscote, but before putting the question to the vote he desired to say that he heartily concurred in the proposal. There appeared to be some opinion amongst those who had spoken against the motion that the fact of its passing would injuriously affect hunting and hunting horses, but Sir Nigel had brought it forward in a very moderate way, so that only horses up to two years old were affected. There was nothing in the proposal to prevent people docking their horses even then if they were so disposed. He hoped he should never see his friend Mr Ashworth attempting to drive two-year-olds, or his friend Mr. Hornsby attempting to hunt them.

The motion was then put from the Chair, and declared to be carried by 25 votes against 21.

Veterinary Inspection of Horses.

Mr. A. J. SMITH then moved the following resolution, of which he had given notice:—

> That Regulation 48 be altered to read that "no prize be awarded to any animal entered in the breeding classes for horses, unless such animal, after a veterinary examination, shall be pronounced free from indications of hereditary disease."

He said that his wish in making this motion was to extend to the younger classes the same regulation that they had applied to stallions and brood mares. The younger classes would include three-year-old fillies, two-year-old fillies, and yearling fillies. He thought that they as a Society ought to hesitate before they recommended any animal through their show to intending purchasers amongst the public at large, when they had not subjected it to a thorough examination as to its soundness. In affixing their rosettes and prizes to the animals at their shows they did in reality recommend them to the outside public. As the rule now stood their Society was placed in a false position, and, he might add, a ludicrous one; for by their action they certainly said that it was of importance for an aged animal to be sound, but that the soundness of the younger animals was of minor importance. Nearly all the county meetings recognised the value of veterinary inspection, and it was very hard lines indeed upon an exhibitor who sent his animal some 100 or 200 miles to the "Royal" show to find an animal that had already been discredited at a county show placed before his animal, which was perhaps a much better one. The objection to his proposal appeared to be that they might complicate the work of the showyard; but, he asked, were they to hesitate for fear of the work? If the thing were desirable, surely theirs should not be the one Society to stop at any heavy work which it might involve. If it were the right thing, it ought to be done. If the change he proposed were to take effect for next year, he fancied that a good portion of the work

would fall upon him, as he happened to be the Senior Steward of that department. He knew that he had the exhibitors and the public at his back, and he asked them not to throw aside the suggestion of a practical man on a practical subject.

The motion having been seconded by Mr. TERRY,

The Hon. CECIL PARKER, in opposing it, said he thought they had gone quite far enough, and, without taking up the time of the Council, he might say that the change would involve an enormous amount of work, of which Mr. Smith had no conception.

The motion was then put from the Chair, and declared carried by 11 votes to 9.

Judging of Poultry.

The Hon. CECIL PARKER moved, pursuant to notice:—

> That the poultry exhibited for the Society's prizes be required to be in the showyard on the evening of the Friday before the opening of the entire showyard, and that they be judged on the Saturday.

He said he did not think that this resolution was at all of a contentious character. Poultry were one of the few classes of live stock that were judged with closed doors. It would be a great advantage to the public to see as much as they could on the Monday, and they ought to open as many departments as they possibly could on that day. They opened the Cheese and other Produce on this day last year with very great success.

Mr. DUGDALE seconded the resolution, which was carried unanimously.

Implement Committee.

Mr. SANDAY reported that the Committee had considered the implement regulations for the Maidstone Meeting, and recommended that prizes of 20*l.* and 10*l.* be offered in two classes for hand and for power Cream Separators. They further recommended that at the York Meeting of 1900 prizes be offered for Cultivators, Milking Machines, and Sheep-Shearing Machines, both power and hand.

General Maidstone.

Earl SPENCER (Chairman) reported that a total of sixty-two entries had been received for the six classes of hops, for which prizes were offered at the Maidstone Meeting. The Maidstone Local Committee had undertaken to provide the gold medals for the Queen's premium stallions serving in the district, upon the understanding that the animals were exhibited in the showyard, as in previous years. Messrs. Tootell and Sons, of 13 King Street, Maidstone, had been appointed as official agents for the letting of houses and apartments by the Local Committee.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that the Committee had considered the tenders which had been submitted for the supply of timber for the construction of the Maidstone showyard, and they recommended the acceptance of that sent in by Messrs. T. & H. Green.

Selection.

Sir JOHN THOROLD (Chairman) presented the Committee's recommendations with regard to the vacancies on the Council caused by the deaths of Sir Thomas Acland and Mr. Scarth.

Education.

Mr. DUGDALE presented a report from the Committee upon the results of the recent examinations for the National Diploma in the Science and Practice of Dairying (see page 736). The Committee gave notice that, at their next meeting, they would move for the renewal of their annual grant of 500*l.*

Dairy.

Mr. CRUTCHLEY (Chairman) reported that progress had been made with the preparation of a schedule of prizes for dairy cattle and dairy produce for incorporation in the draft prize-sheet of the Maidstone Meeting to be brought up in December.

Date of Next Meeting.

The Council then adjourned until Wednesday, December 7 next, at noon.

WEDNESDAY, DECEMBER 7, 1898.

THE EARL OF COVENTRY (PRESIDENT) IN THE CHAIR.

Present:

Trustees.—H.R.H. the Prince of Wales, K.G., Sir Walter Gilbey, Bart., Colonel Sir Nigel Kingscote, K.C.B., the Duke of Richmond and Gordon, K.G., Earl Spencer, K.G.

Vice-Presidents.—H.R.H. Prince Christian, K.G., Mr. H. Chandos-Pole-Gell, the Right Hon. Henry Chaplin, M.P., the Earl of Feversham, Lord Moreton, Sir John Thorold, Bart., Mr. Charles Whitehead.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. George Blake, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Mr. F. S. W. Cornwallis, M.P., Mr. Percy E. Crutchley, Lieut.-Col. J. F. Curtis-Hayward, Mr. A. E. W. Darby, the Earl of Derby, K.G., Mr. J. Marshall Dugdale, Mr. W. Frankish, Mr. R. Neville Grenville, Mr. James Hornsby, the Earl of Jersey, G.C.M.G., Captain W. S. B. Levett, Mr. C. S. Mainwaring, Mr. Henry D. Marshall, Mr. Joseph Martin, Mr. T. H. Miller, Mr. P. A. Muntz, M.P., the Hon. Cecil T. Parker, Mr. Albert Pell, Mr. J. E. Ransome, Mr. Frederick Reynard, Mr. Howard P. Ryland, Mr. G. H. Sanday, Mr. A. J. Smith, Mr. Henry Smith, Mr. E. W. Stanyforth, Mr. R. Stratton, Mr. Martin J. Sutton, Mr. Garrett Taylor, Mr. J. P. Terry, Mr. R. A. Warren, Mr. E. V. V. Wheeler, Mr. J. C. Williams, Sir Jacob Wilson.

Officers.—Sir Ernest Clarke, Secretary; Dr. Fream, Editor of the Journal; Dr. J. Augustus Voelcker, Consulting Chemist; Mr. J. E. Compton-Bracebridge, Assistant Director; Mr. R. S. Burgess, Superintendent of the Showyard.

Professor Sir George Brown, C.B.; Professor McFadyean.

The following members of the Maidstone Local Committee were also present: Lord Arthur Cecil, and Mr. R. A. Hamilton Seymour (Local Secretary).

Apologies for non-attendance were received from Earl Cawdor, the Marquis of Granby, Mr. Victor C. W. Cavendish, M.P., Mr. D. Pidgeon and Mr. C. W. Wilson.

The minutes of the last meeting of the Council, held on November 2, were read and approved.

Death of the Earl of Lathom.

The PRESIDENT said he regretted very much to have to announce officially to the Council the death of the Earl of Lathom, one of the Society's Vice-Presidents, who joined the Council in 1872, and was President of the Society at the Liverpool Meeting of 1877. He was sure all the Council would regret the loss of a valued colleague.

Election of New Members.

The election of the following thirty members was then proceeded with:—

ALEXANDER, R. H...Brand Fold, Goudhurst.
ARNOLD, George..Frant, Sussex.
BARKER, Albert..Great Bentley, Essex.
BENSON, S...145 St. Owen St., Hereford.
BROOM, H...Wissett, Halesworth
BRUCE, G. B...Hayling Island, Hants.
BURDER, H. C...Sandiway Lodge, Northwich.
CAUDWELL, J. W...Gt. Massingham, Norfolk.
CHAYTOR, J. C...Marshlands, Picton, N.Z.
CONSTABLE, H. S...Wassand, Hull.
DIMMOCK, J. B...Shotford, Harleston.
DRIVER, W. D...Chatham.
DUNNING, E. H...Stoodleigh Ct., Devon.
FINN, Charles..Elham, Canterbury.
GOODCHILD, T...Gt. Yeldham, Essex.
GRIMBLEY, H. G...Sutton Bridge, Lincs.
HAMMOND, G. D...Amblehurst Farm, Wisboro' Green, Billingshurst
HODGES, T. A...Hill House, West Malling.
HORLICK, R. A...New Malden, Surrey.
LYON, F. G...East Court, Finchampstead.
MONTGOMERY, G. C...Assendon, Henley-on-T.
NEVE, E...Chart Sutton, Maidstone.
PARTON, F. J...Koppa, Mysore, India.
PASS, A. C...Wootton Fitzpaine, Dorset.
ROWCLIFFE, H. S...Ryehill, Nunthorpe.
SMITH, H. S. W...Water Ho., Bletchingley.
STAPYLTON, Miles J...Myton Hall, Helperby
SWAIN, Tom..Anglesea Road, Ipswich.
THIRKELL, A...Paddock Wood, Kent.
WELFEAR, Thos. E...East Peckham, Kent.

Finance.

Sir Nigel Kingscote (Chairman) reported that the accounts for the month ended November 30, 1898, as certified by the Society's Accountants, showed total receipts for that period amounting to 1,275*l.* 18*s.* 1*d.*, and expenditure amounting to 838*l.* 8*s.* 3*d.* Accounts amounting to 4,190*l.* 15*s.* 4*d.* had been passed, and were recommended for payment. The balance-sheet for the Birmingham Meeting, as passed by the Auditors, and showing a debit balance of 1,567*l.* 16*s.* 2*d.*, was laid upon the table. The loss would have been much larger but for the generosity of the Local Committee in handing over to the Society the greater part (645*l.*) of the surplus of their local fund. The Committee had met nine times and made nine reports during the year.

In presenting this report, Sir Nigel Kingscote said that he was sure the Council would appreciate very much the generosity of the Local Committee in the disposal of the surplus of their fund, and he moved a vote of thanks to them for their action in the matter, which was carried unanimously.

House.

Sir Nigel Kingscote (Chairman) reported that various accounts had been passed and referred to the Finance Committee for payment, and other matters of detail had been decided upon. The Committee had met seven times and made seven reports during the year.

Journal.

Sir John Thorold (Chairman) reported that the arrangements for the next number of the Journal had been considered, as well as a number of suggestions for articles and notes. The Committee recommended that an Index to the first ten volumes of the third series of the Journal should be compiled for publication in 1900. They had also approved the publication in the Journal of photographs of a number of the Pot-Culture Experiments carried out at Woburn. It was proposed that a portrait of the Brothers Colling should appear as a frontispiece to the next volume of the Journal. The Committee had met eight times and made eight reports during the year.

Chemical and Woburn.

Mr. Warren reported that the results of the Woburn field experiments for the twenty years 1877–1897 had been revised, and would appear in the Society's Journal. Dr. Voelcker had submitted details as to the feeding experiments for the present winter season, and reported the conclusion of the investigations as to the cure of Finger-and-Toe in turnips. The annual report of the Consulting Chemist had been submitted and approved, and was recommended for publication in the Journal (see p. 711). The Committee recommended that in all future conditions of purchase and sale of fertilisers, the degree of fineness for basic slag should be 80 to 90 per cent. instead of 70 to 90 per cent. as at present. They moved for the renewal of their annual grants of (*a*) 200*l.* for Pot-Culture Station during 1899, and (*b*) 100*l.* for Grass Experiments during 1899. The Committee had met eight times and made eight reports during the year. Dr. Voelcker had presented the following report:—

Report of Consulting Chemist.

Material Sold as Basic Slag.—Mr. J. K. Lister, of Park Hill, Doncaster, sent on November 5 a sample of what he said had been represented to him as "basic slag." Analysis of this, however, showed:—Phosphoric acid, 0·12 per cent. only, and the material was in no sense "basic" slag.

Basic Slag Insufficiently Ground.—A sample of basic slag sent for analysis showed only 72·85 per cent. "fineness." This is too low, and, as a guarantee of 80 to 90 per cent. is now readily procurable, purchasers should insist on having this material finely ground.

Foreign Linseed Cake.—Mr. O. L. Evans, of Broom Hall, Chwilog, R.S.O., Carnarvonshire, had had supplied to him from Liverpool a delivery of linseed cake. After examining a sample, I reported that it was "a cake probably of foreign make, mouldy both externally and internally, and not in proper condition for feeding. It has also a good deal of hair and rope with it."

Linseed Cake Deficient in Oil.—Mr. J. M. Moubray, of Sutton, Iford, Lewes, sent on October 8 for analysis a small sample of linseed cake, of which he had purchased 2 tons from a local dealer. The cake was sold with a guarantee that it contained 12 per cent. of oil. Analysis of the small sample showed it to contain only 9·48 per cent. of oil, and on Mr. Moubray sending by request

a larger sample of two whole cakes, they were found to have 10·61 per cent. of oil. Meanwhile the manufacturers had a further sample taken by their representative, which they sent to Hull for analysis. The result was, oil 10·74 per cent., and the deficiency was allowed for by the manufacturers.

(Signed) J. AUGUSTUS VOELCKER.

Dec. 3, 1898.

Botanical and Zoological.

Mr. WHITEHEAD (Chairman) reported that the annual reports of the Consulting Botanist (see p. 751) and Zoologist (see p. 758) had been passed, and were recommended for publication in the Journal. The proposed regulations for the trials of fruit and vegetable evaporating machines and fruit packages had been considered and approved. The Committee had met eight times and made eight reports during the year.

Veterinary.

The Hon. CECIL T. PARKER (Chairman) reported that the Committee recommended the acceptance, with thanks, of the offer of the Worshipful Company of Farriers of the freedom of their Company to the first-prize winners in the horse-shoeing competitions at the Maidstone Meeting. Sir George Brown had reported that an eruptive disease of the skin of cattle, associated with the loss of hair, was very prevalent in different parts of the country, and had led to the rejection of animals sent to the Royal Agricultural and other shows. In the few cases which had been already examined no evidence of the presence of the mange insect had been found, and in two cases only had the fungus of ringworm been detected. It was possible that several diseases were included in the term which was commonly applied, viz., mange. The Committee thought it important that a scientific investigation should be made, and they accordingly asked the members of the Society to send to the Royal Veterinary College specimens of hair or scabs from the diseased animals. If the owner of a typically diseased animal were willing, the animal itself might be forwarded to the College. The Committee had no recommendations to make as to the suggestion by Mr. Neville Grenville referred to them by the Council at their last meeting. They had considered Mr. Stratton's detailed suggestions with regard to compensation for tuberculosis, but were unable to recommend their adoption, as they were contrary to the recommendations of the Royal Commission on Tuberculosis. They moved for the renewal of their annual grant of 600*l.* for the year 1899, of which 500*l.* would be allocated to the Royal Veterinary College in aid of the study of comparative pathology and bacteriology. The Committee had met eight times and made eight reports during the year.

Professor McFadyean had presented the following report:—

ANTHRAX.—During the last four weeks forty-two outbreaks with seventy-two animals attacked have been reported. The outbreaks during the first forty-eight weeks of this year number 514, with 710 animals attacked, against 397 outbreaks and 828 animals attacked in the corresponding period of 1897.

GLANDERS.—The outbreaks for the last four weeks number forty-five, and the animals attacked eighty-three. For the forty-eight weeks of this year already reported upon the outbreaks were 689, with 1,281 animals attacked, against 835 outbreaks and 1,460 animals attacked during the same period of last year.

SWINE FEVER.—During the last four weeks 102 outbreaks have been reported, being an increase of fifty-eight outbreaks over the same period of 1897. The total outbreaks for the current year now number 2,320, against 2,078 for the first forty-eight weeks of last year.

RABIES.—No case of this disease has been reported since the first week of October.

MISCELLANEOUS.—The number of morbid specimens sent to the research laboratory for examination during the month of November was thirty-eight. These included cases of anthrax, tuberculosis, actinomycosis, diseases caused by animal parasites, tumours, poisoning, &c.

Tuberculous Milk.

Mr. PARKER said that a letter had been received by him from Mr. Ashworth, on the subject of tuberculous milk, too late for the matter to be placed on the Agenda paper. The letter suggested that a leaflet should be prepared by Sir George Brown, the title of which might be settled by the Committee. Sir George Brown had said there would be no difficulty in writing the leaflet if the Council approved of its being done.

This was agreed to.

A letter from the Gloucestershire

Agricultural Society as to the proposed action of the London County Council with regard to slaughter-houses was referred back to the Veterinary Committee, after remarks by Mr. TERRY and Mr. SUTTON.

Cubic Air Space in Cow Byres.

Mr. PARKER remarked that no reply had yet been received from the Local Government Board as to the question of Cubic Air Space in Cow Byres, which had been pressed upon them by the Society, but it was understood that this subject was receiving the personal attention of the President of the Board. He trusted that as that gentleman was present, he would give the Council some assurance as to the future.

Mr. CHAPLIN said that he would like to take the opportunity of stating that he was not by any means unmindful of the representations made to him last December by the deputation who waited on him on behalf of the Society, and he had been carefully considering the question of the issue of model regulations by his Department. A good deal of misapprehension seemed to exist as to the action of the Local Government Board in this matter, and he wished to explain that, although the Board could put a veto on objectionable bye-laws of local authorities, it had no power to make them. The Board was at that time engaged in conference with the Board of Agriculture in considering the question of model regulations, which he hoped might meet the views of the Society.

Mr. ASHWORTH pointed out that the matter had been before them several times. He had listened with great interest to Mr. Chaplin's remarks and to the statement which he had made on the subject. But in the county in which he was interested the farmers and landowners had been involved in a heavy expense in providing 800 cubic feet of air space for their cows, owing to the restrictive action of the local authorities; and the Local Government Board's responsibility for the requirement of this number of feet had not been so distinctly contradicted by the Board, or at all events not so distinctly understood by the public, as had been now stated by Mr. Chaplin.

Docking of Horses.

The SECRETARY laid upon the table a quantity of correspondence from societies and individual members, received since the last meeting, relative to the following resolution passed by the Council on November 2:—"That at and after the Maidstone Meeting of 1899, no foals with docked tails be allowed to be exhibited at the Society's Country Meetings; that at and after the meeting of 1900, the same rule shall apply to yearlings as well as foals; and that at and after the meeting of 1901, to two-year-olds also." Resolutions expressing disapproval at this decision, and requesting a reconsideration of the matter, had been received from the following societies amongst others:—The Shire Horse Society, the Agricultural Societies for the counties of Cambridge, Leicester, and Nottingham, the Chester and Malton Farmers' Clubs, the Driffield and East Riding, Lancaster, Malton, and Peterborough Agricultural Societies, the North Cotswold Farmers' Association, and the Horse Societies of Melton Mowbray, Montgomeryshire, Tanat Side, Waltham Cross, and Welshpool.

Sir WALTER GILBEY, in rising to move that the Council's resolution of November 2 should be made to apply to the hunter classes only, said that he would naturally have preferred, after the attitude he had felt it right to take up in this matter, that such a resolution should have been placed in the hands of some neutral member of the Council. He had not altered his views on the question of docking; but in the general interests of the Society it was felt that some compromise should be arrived at with regard to the position in which the Council was placed by the majority of votes at the last meeting. He had, therefore, agreed to move, and Sir Nigel Kingscote had consented to second, the application of the resolution to the hunter classes only. Undoubtedly those who had voted for the resolution last month had been influenced by a similar decision

which had been arrived at by the Hunters' Improvement Society some time ago, for the exclusion of undocked yearlings from its forthcoming shows. Now, that Society having a show of its own in London next spring, and finding the money, could impose what restrictions its Council pleased. His friend Mr. Hornsby had occupied himself, much to his credit, in obtaining the opinions of hundreds of hunting men on this docking question; and although the Hunters' Improvement Society had taken action in the matter, very many of the gentlemen whom he had interviewed did not think the Council of the Hunters' Improvement Society were discreet in so doing. The Royal Agricultural Society, being a national organisation, was in a different position; and he could not believe that those gentlemen who voted at their last meeting for the resolution, which was to apply to all kinds of horses, could have contemplated the serious opposition to it which had been shown by the breeders of England. He thought there had been quite enough said on the subject, and that if the effect of the resolution was limited in the way proposed, they would hear no more of the matter from the outside public. He hoped the Council would appreciate the serious nature of the opposition to their original proposal, and accept the resolution which, in the interests of peace, he now ventured to submit to them.

SIR NIGEL KINGSCOTE, in seconding the motion proposed by Sir Walter Gilbey, said he would follow Sir Walter's example and say only a few words on the subject, as he did not desire to go again through the arguments for and against docking. He wished, however, to make it clear that he had consented to second this motion entirely in the interests of the Society, although at the same time he adhered to his original opinion. If he had been only concerned personally in the matter, he should have stuck to his guns. Notwithstanding all that had since been written, and all the arguments that had been brought forward on the other side, his opinion against the practice of docking was as strong as before. When proposing the resolution which appeared on the November Agenda Paper, he never thought it would be taken up in the way it had been by various societies in the country. It had been said that the effect of his motion would be to put a difficulty in the way of breeders getting rid of their animals, but he thought he had clearly shown last month that they would have a wider market. He did not in the least regret having brought forward his motion. If the Society had adhered to that motion it would have done a great deal of good, and would have set a good example against a bad fashion. However, in order that they might not have a schism in the Council or at the general meeting to-morrow, and to prevent any further difficulty, he was ready to give way to the extent that the resolution should apply to the hunter classes only, and he begged, therefore, formally to second Sir Walter Gilbey's motion.

MR. P. A. MUNTZ, M.P., said that as president of the largest "work-horse" society in the world (the Shire Horse Society), he would ask permission to make a few remarks upon this subject. He had personally no feeling in the matter, but thought that members of the Council would see that it was desirable to pour oil upon the troubled waters. He did not think Sir Walter Gilbey's proposition would close the discussion on the subject. He formed his opinion from the fact that in every part of the country he had lately visited he had been spoken to in the strongest manner by agriculturists about this docking resolution of the Council.

The question had been dealt with under four heads:—(1) He had been told that it was a question of cruelty. But it could not be said that it was any less cruel to dock a horse when it was three or four years old than when it was a foal. (2) Next he was told that it was a question of danger. No one could possibly argue that horses were less dangerous when they had long tails than when they had short ones. (3) They were told that it was a question of steering; but they could hardly give serious consideration to this view. He might illustrate this by an anec-

dote. A certain professor was giving a lecture, and in mentioning the greyhound, said that the reason why that animal had a long tail was for the purpose of steering itself, when a hard-headed man in his audience exclaimed, "How about the hare, mister?" On that occasion only, the volubility of the professor was unequal to answering the question. (4) Lastly, there was the question of convenience and cleanliness. Every horse-owner and every head groom knew perfectly well that it was far less trouble to clean a horse with a short tail than to clean one with a long tail. In the hunting-field, moreover, a horse with a long tail not only gathered up a quantity of mud and dirt, but, in swishing his tail about, smothered his rider and his rider's friends with filth. The resolution of last month, if it had been carried into effect, would have entailed a heavy tax upon the cultivators of arable land. A man starting out with his team in the morning would have to plait up the horses' tails, and in the evening would have to undo and clean them. There was no doubt that it would involve a large amount of extra labour, which would have to be paid for, and therefore it was a tax upon the farmer.

The resolution had met with extreme condemnation from all the Horse Societies, with the exception of the Hunters' Improvement Society. That Society had in other ways done a great deal of good, but he entirely disapproved of the resolution that had been passed by it with regard to docking. It was, in his opinion, a very unwise resolution, and that Society was not justified in imposing restrictions that affected all the hunting men of the kingdom. The Royal Agricultural Society was in a different position altogether: it was a national society; and he was of opinion that by passing such a resolution they would be doing a great injustice to the breeders of hunters in this country. There were foals born with crooked docks, and if one man showed a foal with a straight dock, and another exhibitor one with a crooked dock, the man showing the straight-tailed animal would certainly win in the Society's showyard. It was impossible to look straight at a crooked dock, and he spoke as a man who had judged hunters at many shows throughout the kingdom. The fact of a crooked dock would at once disqualify. The feeling throughout the country was extremely strong on this question of docking; in fact, the Council hardly realised the strength of that feeling at the present moment. He begged to move as an amendment the following:—

"That in consequence of the strong opposition expressed in all parts of the country by agricultural and horse societies, the resolution passed by the Council on November 2nd, excluding young docked horses from competition at the Society's country meetings shall not yet apply."

He earnestly urged the Council to pass the resolution in the form he had submitted it to them.

Mr. James Hornsby, in seconding the amendment, said that during the past month he had been collecting opinions on the subject of docking, and had not met a single breeder who had not expressed the feeling that it ought to be left to his own option as to whether he should dock or not. He would say that the interest felt by all breeders of hunters in Leicestershire, Lincolnshire, Rutland (and, if Lord Spencer would pardon him, he should like to include Northamptonshire also) was very keen. He must say that if this resolution were carried into effect, it would be a very great loss to the breeders of hunters.

H.R.H. Prince Christian, as the seconder of the resolution which was carried at the last Council meeting, felt bound to say a few words on the subject under discussion. Although he still held entirely to the opinion he expressed on that occasion, he was prepared in deference to the feeling which seemed to exist in various parts of the country, and which had been so strongly expressed by Mr. Muntz, to support the resolution proposed by Sir Walter Gilbey, and seconded by Sir Nigel Kingscote. He did not want to go further into this question, but as mention had been made of hunters, he might say, that he held in his hands a letter from one of the best known sportsmen in the country, and, he believed, one

of the oldest masters of foxhounds, Mr. T. C. Garth, who wrote that he "bred a few half-bred horses for hunters, and never thought of docking them. He preferred the appearance of the full tails, and they were useful to keep the flies off." He (Prince Christian) regretted that he could not agree with his friend Sir Walter Gilbey in the views he had expressed last month as to the improvement in appearance caused by docking. For his own part he looked forward with pleasure to the opportunity which now might occur of his not being obliged to appear in the hunting-field upon a tailless horse.

The Rt. Hon. Henry Chaplin, M.P., said he had not followed so closely as perhaps he ought to have done the recent controversy connected with the docking of horses. Although he would have been a warm supporter of Sir Nigel Kingscote's resolution passed at the last Council, had he been present, he was not by any means in favour of abandoning the practice of docking altogether. On the contrary, in the case of hunters certainly, and generally in the case of hacks, the animals would be better for docking than without it. He would go further, and say that with regard to the four points raised by Mr. Muntz—the questions of cruelty, of danger, of steering, and of comfort and cleanliness—he did not think there was much difference of opinion between them.

There were, however, two statements made by Mr. Muntz to which he took exception. It was argued that the passing of this resolution would entail a great tax upon every farmer by the additional labour it would impose in tying up his cart horses' tails But that was a mistake. There was nothing in the motion to prevent a farmer, if he pleased, from docking every horse in his stable. The only disability that would be imposed on a farmer would be that if he docked his horse before a certain age he could not exhibit it at the Society's meetings as a foal, yearling, or two-year-old.

He had heard with even more surprise the second reason urged by Mr. Muntz. His case was this: Half-bred foals were born at times with crooked docks. If one exhibitor showed a foal with a straight dock and another a foal with a crooked dock, they all knew what would happen. The fact of a crooked dock would at once disqualify, and the foal with the straight dock would win. But, under these circumstances, docking would appear to be merely an expedient to conceal in a foal what was admittedly a defect, and to enable it to win a prize to which it would not otherwise be entitled. That did not seem to him to be an argument to justify opposition to Sir Nigel Kingscote's original resolution. What induced him mainly to support it was the practice—the monstrous practice as he thought—in recent years of docking horses so short as to leave them, in nine cases out of ten, with nothing but a stump instead of a tail. It ruined the appearance of all the high-class horses in the country.

How, or when, or for what reason it became the fashion, he did not know, but it had now reached such an extreme that it was difficult to find a horse free from this disfigurement. In saying this, he was sure he was speaking in the direct interests of breeders of horses. In his younger days, when he was buying horses almost every week, it was quite different; but at the present time it was almost impossible for a purchaser to find a horse to buy with a decent or well-shaped tail. If they asked some of the great dealers in London and Paris, men who for years had sold the highest class of horses, they made the same complaint: "All the horses are spoiled by the way in which they are docked." Purchasers should be given a chance to buy what they liked. He certainly thought that, in a Council like theirs, where they were all animated by the same desire, viz., to do what was best in the interests of the breeders, they would do right to accept the terms of the amendment brought forward by Sir Walter Gilbey, and supported by Sir Nigel Kingscote that day. He felt certain that the mere raising of the question would do good, as it would call attention to the fact, that in the opinion of great numbers of the horse-loving world, the practice

of docking had been carried to an absurd and unsightly extreme.

Sir JACOB WILSON said that as he was not present when the question was last discussed, perhaps he would be permitted to say a few words now. He had never docked a foal in his life, and he did not suppose he ever should; but he always docked his animals when three years old. At the same time he did not feel justified in dictating to his neighbour over the hedge what he ought to do. Possibly they might be able to modify the resolution in the manner which had been suggested that day; and it was for the Council to consider, if they threw over the resolution, whether they were not putting themselves into a position of doing nothing at all. He appealed to Mr. Muntz and to Mr. Hornsby in this matter, as it was in the interests of the Society to adopt the resolution moved by Sir Walter Gilbey and seconded by Sir Nigel Kingscote. He would suggest to Mr. Hornsby to bring the Hunters' Improvement Society more into line with regard to this question, and he trusted very much that Mr. Muntz would be disposed to withdraw his amendment, and let them go to-morrow to the general meeting as a united body.

Mr. MUNTZ explained that he had no feeling whatever in this matter except in the interests of the Society. He was clearly of opinion that if Sir Walter Gilbey's resolution remained as it stood, it would do a great deal of harm to the Society. Therefore, if by any means Sir Walter would accept his modification of his motion, he was sure it would remove a great difficulty.

The Earl of FEVERSHAM, in supporting Sir Walter Gilbey's motion, said that he hoped the Council would not pay too much attention to outside clamour. He quite felt that after what had occurred outside the Society the Council should proceed guardedly on this subject. For himself, he was quite ready to accept the motion which had been proposed by Sir Walter Gilbey and seconded by Sir Nigel Kingscote, as a step in the right direction. He only regarded it as a step. He thought that the present system of docking was carried to a pernicious extreme, and that it was an ugly, a cruel, and a vulgar practice. It was for the Society to set an example in this matter, and he therefore hoped that the motion would be accepted by the Council.

The DUKE of RICHMOND and GORDON observed that it was not his intention to enter into the question of the docking or non-docking of horses, but he would venture to suggest to his friend Mr. Muntz that if his amendment were carried, and the proposal of Sir Walter Gilbey were not carried, the Council would still have before them the original motion. He thought it would be unwise to follow Mr. Muntz and to reject Sir Walter Gilbey's proposal. He was, therefore, in favour of supporting Sir Walter's proposition.

Mr. ASHWORTH said that he understood Mr. Muntz's resolution to be tantamount to rescinding the original motion. He was confident himself that these half measures were not in the interests of the Society. He thought it would be more dignified to rescind the resolution in deference to the popular wish which had been expressed, and he felt that the amendment was hardly satisfactory.

Mr. CORNWALLIS was of opinion that young stock should be shown in their natural condition, and that the original resolution of last month should be adhered to.

Mr. PELL remarked that they had had some evidence brought before them as to the result of the resolution passed at the last Council, but this did not at all convince him that such was the popular feeling of the country. Since the last Council he had obtained the opinion of the best men of his acquaintance, and of the breeders of some of the best stock of the hunter class, and of other classes of animals, and, without any exception, all those men had approved of the resolution which had been carried in November. He therefore hoped that their feelings would not be influenced by any fear of losing members. The members of the Royal Agricultural Society were not all horse-breeders.

Mr. SUTTON suggested that the matter might be met by an instruction to the judges that extremely

short docking should be considered to detract from the merits of a horse exhibited at the Society's meeting.

After some further discussion, Mr. Muntz's amendment was put to the vote, and carried by 26 votes to 22, and was afterwards carried as a substantive motion.

Stock Prizes.

The Hon. C. T. PARKER reported that the Aberdeen-Angus cow Pridella of Dalmeny 2nd, No. 1120, exhibited by the Earl of Rosebery in Class 119 at the Birmingham Meeting, to which the third prize had been awarded, had failed to comply with the regulations as to calving. The Committee therefore recommended that the third prize be awarded to the reserve number, No. 1114, Mr. Fred. Crisp's "Shepherdess," which had been exhibited in milk. The Committee had considered various letters and suggestions on the subject of the prize-sheet for the Maidstone Meeting, and having finally revised it, recommended its adoption and issue forthwith. The total value of prizes, exclusive of the champion prizes and medals offered by the various Breed Societies, was 6,354*l.*, to which the Maidstone Local Committee had contributed the handsome amount of 1,230*l.* The distribution of prizes was as follows:—

	£	*s.*	*d.*
Horses . . .	1,835	0	0
Cattle . . .	1,770	0	0
Sheep . . .	1,410	0	0
Pigs	360	0	0
Poultry . . .	208	10	0
Produce . . .	477	0	0
Horse-shoeing . .	82	0	0
Hives and honey .	61	15	0
Implements . .	140	0	0
	£6,354	5	0

The Committee recommended the acceptance, with thanks, of the following champion prizes:—

Shorthorn Society.—Two champion prizes of 20*l.* each for the best male and the best female in the Shorthorn classes.

Sussex Cattle Society.—A champion prize of 10*l.* for the best Sussex animal exhibited.

Lincoln Long Wool Sheep Breeders' Association.—A champion prize of 10*l.* for the best Lincoln ram exhibited.

The Committee had met eight times and made eight reports during the year.

Implement.

Mr. FRANKISH (Chairman) reported that the Committee had further considered the regulations for the exhibition and trial of implements in connection with the Maidstone Meeting, which they had amended and finally approved. They had also considered the selection of judges for the various classes of implements for which prizes are offered in connection with the Maidstone Meeting. They recommended that in connection with the York Meeting of 1900, prizes of 40*l.* and 20*l.* be offered for the best Cultivator for general purposes. The Committee had met eight times and made eight reports during the year.

General Maidstone.

Mr. CRUTCHLEY reported that the Committee had accepted, with thanks, a further offer from the Maidstone Local Committee of prizes of 15*l.*, 10*l.*, and 5*l.* for five Lincoln shearling rams, and that the local prizes had been finally settled. Various matters connected with the show had been arranged, and the Committee had requested the Local Committee to submit the names of gentlemen recommended by them as judges of Hop-washers, Fruit and Vegetable Evaporators, and Fruit Packages.

Showyard Works.

Sir JACOB WILSON (Chairman) reported that an arrangement had been made with the Catering Syndicate for the supply of refreshments at the Maidstone Meeting. The Committee had decided to recommend the Council to insure some of the workmen employed in the showyard against the risks under the Workmen's Compensation Act, 1897, and had discussed and settled various details relating to the Maidstone Meeting. They recommended that the seal of the Society be affixed to the agreement with the Mayor and Corporation of York for the meeting of 1900. The Committee had met eight times and made eight reports during the year.

Selection.

Sir JOHN THOROLD (Chairman) presented the Committee's recommendations (1) that Lord Arthur Cecil, of Orchardmains, Tonbridge, Kent, be elected a member of Council in the room of the Duke of Bedford, appointed Vice-President, and (2) that Mr. Frederick Reynard be appointed a Steward of Stock, and Mr. Howard P. Ryland a Steward of Implements.

The Committee had met eight times and made eight reports during the year. They recommended that, in accordance with the standing order passed at the Council on December 11, 1895, the Committee of Selection be constituted for the ensuing year of the President, the Chairmen of each of the Standing Committees, Mr. Cornwallis, Mr. Hornsby, and Mr. Terry, and the following three members of Council: Sir Walter Gilbey, Mr. Ashworth and Mr. Rowlandson, in the room of Col. Curtis-Hayward, Mr. Dugdale, and Mr. Sutton, who retired by rotation.

On the motion of Sir JOHN THOROLD, seconded by Lord MORETON, Lord Arthur Cecil was formally elected a Member of the Council.

Education.

Lord MORETON (Chairman) reported that a letter from the Highland and Agricultural Society suggesting that the two National Societies should combine to conduct a joint examination in Agriculture, as in Dairying, had been received, and that the Committee recommended that the Society's delegates on the Joint Board be empowered to discuss the matter with their Scottish colleagues, and to report at the next meeting of the Committee. The Committee had met eight times and made eight reports during the year, and they moved for the renewal of their annual grant of 500*l*. for the year 1899.

Dairy.

Mr. CRUTCHLEY (Chairman) reported that the Committee had finally settled the regulations for the trial of cream separators at Maidstone. They had made various other arrangements connected with the Maidstone Meeting, and had considered the appointment of judges of butter and cheese. The Committee had met eight reports during the year.

Standing Committees for 1899.

The following Standing Committees were appointed for 1899:—Finance, House, Journal, Chemical and Woburn, Botanical and Zoological, Veterinary, Stock Prizes, Implement, Showyard Works, Selection, Education, Dairy.

The present members of the various Standing Committees were (with some exceptions) reappointed to those Committees. Mr. Victor C. W. Cavendish was added to the Stock Prizes Committee, Captain Levett and Mr. Reynard to the Chemical Committee, Mr. Rogers to the Education Committee, and Mr. J. C. Williams to the Botanical and Zoological and Stock Prizes Committees.

Committee for Selection of Judges.

On the motion of Mr. CRUTCHLEY, seconded by Sir JOHN THOROLD, a Committee was appointed to recommend judges of stock, poultry, and produce at the Maidstone Meeting, such Committee to consist of the members of the Stock Prizes Committee and the Stewards of the several departments, and to sit for the first time in February next.

Miscellaneous.

On the motion of Sir NIGEL KINGSCOTE, seconded by Sir JOHN THOROLD, the Society's seal was authorised to be affixed to the agreement with the Corporation of York as to the Society's Country Meeting of 1900, and to other documents.

The report of the Council to the General Meeting of Governors and Members, to be held on the following day, was prepared, and it was decided that the meeting should be held in the Great Hall of the Royal Medical and Chirurgical Society at 20 Hanover Square.

Other business having been transacted, the Council adjourned over the Christmas recess until Wednesday, February 1, 1899.

Proceedings at Half-yearly General Meeting of Governors and Members,

HELD AT 20 HANOVER SQUARE.

THURSDAY, DECEMBER 8, 1898.

THE EARL OF COVENTRY (PRESIDENT) IN THE CHAIR.

Present:

Trustees.—Sir Walter Gilbey, Bart., Colonel Sir Nigel Kingscote, K.C.B., the Duke of Richmond and Gordon, K.G.

Vice-Presidents.—Mr. H. Chandos-Pole-Gell, the Earl of Feversham, Lord Moreton, Sir John H. Thorold, Bart.

Other Members of Council.—Mr. J. H. Arkwright, Mr. Alfred Ashworth, Mr. J. Bowen-Jones, Lord Brougham and Vaux, Lord Arthur Cecil, Mr. Percy E. Crutchley, Lieut.-Colonel J. F. Curtis-Hayward, the Earl of Derby, K.G., the Marquis of Granby, Mr. James Hornsby, Captain W. S. B. Levett, Mr. C. S. Mainwaring, the Hon. Cecil T. Parker, Mr. Albert Pell, Mr. Frederick Reynard, Mr. Joseph P. Terry, and Sir Jacob Wilson.

Governors.—The Earl of Portsmouth, Sir Gilbert Greenall, Bart., Mr. W. F. Holt Beever, Capt. the Hon. W. H. O. Duncombe.

Members.—The Earl of Verulam, the Hon. A. H. Cathcart, the Hon. J. E. Cross, the Hon. H. A. Stanhope, Sir John Gilmour, Bart., Sir Edmund Verney, Bart., Professor Sir George Brown, C.B., Messrs. Arthur Arkwright, R. C. Assheton, Captain W. E. Beak, Messrs. U. Roland Burke, Thomas W. Cadman, Austin C. Carr, Thomas Carrick, W. W. Chapman, A. C. Cope, Horace F. Cox, J. P. Cross, H. S. Daine, H. Denis de Vitré, Henry Dudding, T. H. Elliott, C.B., George England, William England, Herbert S. Fenning, C. B. Fisher, E. Snow Fordham, William Fortune, C. E. Galbraith, George M. Gale, Tresham Gilbey, Rev. John Gillespie, W. W. Glenny, Ernest H. Godfrey, H. J. Greenwood, Robert G. Hanson, T. G. Macaulay Hine, C. Howatson, Surgeon-Lieut.-Colonel John Ince, M.D., Messrs. Frederick King, William Lipscomb, C. J. B. Macdonald, Peter McLagan, J. H. Master, H. Mellish, R. Jasper More, M.P., Captain W. E. F. O'Brien, Messrs. Edgar S Peachey, R. C. Pearce, Professor John Penberthy, Messrs. C. M. S. Pilkington, T. F. Plowman, John Powell, Clare Sewell Read, William Rees, E. S. Rodd, G. F. Sheppard, Frank Silvester, Marshall Stephenson, G. W. Symondson, J. Herbert Taylor, W. J. Thody, John Thornton, C. W. Tindall, R. B. Turton, Alan H. Twentyman, A. C. Twentyman, and T. P. Wilkes.

Officers.—Sir Ernest Clarke (Secretary), Dr. J. Augustus Voelcker (Consulting Chemist), Dr. Fream (Editor of the Journal), Mr. J. E. Compton-Bracebridge (Assistant Director), Mr. R. S. Burgess (Superintendent of the Yard).

Report of the Council.

The SECRETARY having read the principal paragraphs of the Report of the Council for the past half-year (see p 727),

Mr. W. W. GLENNY said it gave him much pleasure to move the adoption of the Report. Notwithstanding adverse circumstances, the number of members had kept up fairly well on the whole. He still,

however, would urge on the recruiting sergeants of the Society to use their best endeavours to keep up the numbers to the full extent. They did not want to go back, but to go forward, and to increase the number of members year by year. With regard to the show at Sutton Coldfield, the numbers visiting it were not so large as had been anticipated. The reasons for so small an attendance he did not propose to analyse. The show itself was very interesting, and he was sure that whoever attended it was satisfied that the "Royal" show was a thing which could not be overlooked. He was glad to see that the fees of the Royal Veterinary College had been reduced, and he thought that this would very likely be of great advantage to members of the Society who desired information with reference to the nature of diseases of animals. It was a matter of congratulation that the number of samples sent for analysis to the Society's Laboratory was on the increase, because at the present time County Councils were giving very many facilities under the provisions of the Fertilisers and Feeding Stuffs Act, and this and other causes might have militated against the amount of work sent to the Society's Laboratory. But this did not appear to have been so, seeing that the number of samples sent to Hanover Square had been larger than in the preceding year. The Zoologist had drawn attention to the abnormal nature of the past season with regard to caterpillar and aphis attacks, which were immensely injurious in certain districts where these attacks had been excessive. The insects seemed to have had their own way, and had done a very great deal of harm. Probably a change of crop would be the best way of checking the evil, but at all events something would have to be done. He had great pleasure in moving the adoption of the Report.

Mr. W. LIPSCOMB, in seconding the adoption of the Report, said perhaps he might be allowed to refer to some remarks which he made at the last general meeting, with regard to the prizes offered at the Birmingham Meeting for motor carriages. He knew it was the case that many persons endorsed his views that the objects of this Society were not for the encouragement of what undoubtedly served to displace horse power. The competition was chiefly favourable to traders in these carriages, which even if they did not exceed a certain weight, made some amount of noise, and were injurious to farmers and other drivers using the roads. In his own district (Yorkshire) there were many roads not more than 16 feet wide, and it was very difficult to get a horse to pass these motors at such close quarters. The Legislature might say what could legally be done, but it did not necessarily follow that it would do good to agriculture. As it was, the Act allowed certain traders to use the roads without paying for them. There was a large consensus of opinion on this question, and he thought that some action should be taken in the matter, so as to minimise the serious danger to young horses. That was retrospective. Prospectively he would like to emphasise the point as to whether or not some sort of general results could not be focussed with regard to experiments, both on grass and in other directions. In his own district a farm had been established as an object-lesson for farmers; but it seemed to him rather a waste not to concentrate all the information collected by County Councils and other bodies from experiments carried out by them so generously in various parts of the country. If the Council could bring these results to a focus, he ventured to say it would be productive of very great good, and would have the result of bringing more students into the field to attend to the scientific part of their calling.

The Hon. H. A. STANHOPE said he noticed with satisfaction that prizes would be given at the Maidstone Meeting for cream separators, and he hoped that attention would be given to the points of noiselessness and facilities for cleaning the machines. He desired also information as to the reasons for appointing so early a date for the shearing of sheep as March 1.

Surgeon-Lieut.-Colonel INCH, M.D.,

referring to the paragraph of the Report relating to cubic air space in cow byres, said he thought it was a very serious matter indeed for those who depended chiefly upon town dairying for their living. He thought, however, it was one of the greatest mistakes committed by Parliament in their so-called sanitary laws, which should never have been extended in their entirety to rural districts. He would also remind them that the matter was part of the general question of housing not only cattle but also human beings. These regulations had done a great deal towards crippling both the agricultural and horticultural industries. He knew in his own district this matter caused a great deal of anxiety; the rents of cottages were so high that the working classes could not pay them, and overcrowding was the result.

Mr. THOMAS CARRICK called attention to the reference made in the Report to the Royal Commission on Tuberculosis. No doubt the publication of this Report would be followed by some very drastic regulations, and he would urge the Council to use their influence with the Board of Agriculture to take up this question in conjunction with the Local Government Board, so as to avoid any further harassing of the farmers in this country. Some attempt should be made to stamp out this terrible disease. He did not object to the Report of the Commission, yet at the same time, if the Local Government Board had to deal with the matter apart from the Board of Agriculture, they would find that the result to the country would be very serious. He urged the Council to take up the matter with the Board of Agriculture, so that any restrictive attempts aiming at stamping out the disease should be accompanied by compensation to the farmer.

Mr. CLARE SEWELL READ said, with reference to the remarks of the last speaker on the subject of compensation for animals condemned for tuberculosis, that the report of the Commission seemed to him to be against the principle of all our modern legislation. No doubt it would be very harassing under the regulations which would be put in force when the Report of the Royal Commission was acted upon, viz.: slaughter and confiscation minus compensation; but there were a good many other regulations almost as harassing in this country. For instance, it was difficult and expensive to alter their old machines to make them comply with the Chaff Cutters' Act. Judge-made law prevented the English farmer dishorning wild cattle, but it was legal in Ireland and Scotland. The Central Authority prevented pigs in districts infected with swine-fever from being moved from one part of a farm to another, if they crossed a road; and County Councils insisted upon farmers' carts and waggons giving light to a full moon, while omnibuses need carry no outside lights in Middlesex. With regard to the proposed regulation, which would in all probability bring about the abolition of private slaughter-houses in London, that, he thought, would be calculated to depreciate very much the value of English beef, and would cause a large increase of foreign imports. He was very glad to see that no mention was made in the Report of that question which had so inflamed the agricultural mind of late, viz., the question of docking of horses. He had never docked a horse of his own, but that was no reason whatever why other people should not do so if they were disposed. In some cases it might even be a necessity in order to avoid a terrible accident. He really had begun to think, that what with these harassing restrictions and other ills which encompassed the agriculturist, a new petition should be added to the Litany, which should read as follows: "From the tyranny of Local Authorities and from the fads of all Royal Societies, good Lord deliver us."

The PRESIDENT said that the points that had been raised in discussion upon the Report would receive the attention of the Council and of the various Committees which had charge of the subjects. He then put the motion for the adoption of the Report, which was carried unanimously.

Vote of Thanks to Auditors.

Sir JOHN GILMOUR, Bart., in moving a vote of thanks to the retiring Auditors (Messrs. C. Gay Roberts, A. H.

Johnson, and Jonas M. Webb) for their services during the past year, said that the general body of members were much indebted to those gentlemen who kindly took upon themselves the duties of auditing the Society's accounts on behalf of their fellow-members, and he felt sure that the meeting would desire to express its thanks to the Auditors in a formal manner. The first of the three gentlemen whom he had mentioned (Mr. Gay Roberts) took part in the annual audit of the Society's general accounts held last March, but he was unhappily prevented by a severe illness from attending the more recent audit of the accounts of the Birmingham Meeting. He was sorry to say that from information which had been given to him, there was very little hope of Mr. Roberts being again able to attend to business. Looking to the fact that Mr. Roberts had now audited the Society's accounts for the last seventeen years, he felt confident that everyone present would be grieved to learn that he was incapacitated from giving the Society the benefit of his valuable services in the future. The Society was fortunate, however, in being able to secure the services of so well known a gentleman as Mr. Henry Grinling, who was a partner in a well-known enterprise, and was highly experienced in all financial matters. He desired, therefore, formally to move:—

"(*a*) That the best thanks of the Society are due, and are hereby tendered, to Messrs. C. Gay Roberts, A. H. Johnson, and Jonas M Webb for their services as Auditors during the past year.

"(*b*) That Messrs. Johnson and Webb be re-elected auditors for the ensuing year, and that Mr. Henry Grinling, of Harrow Weald House, Stanmore, Middlesex, be elected auditor in the room of Mr. C. Gay Roberts, whose serious illness necessitates his retirement."

Mr. R. C. Assheton seconded the motion, which was carried unanimously.

Suggestions of Members.

In response to the usual inquiry from the Chair as to whether any Governor or member had any question to ask or suggestion to offer that might be referred to the Council for their consideration,

Mr G. W Symondson said that he noticed in the Report that the Society called attention, amongst other things, to tuberculosis, pleuro-pneumonia, and rabies, but nothing was said about cancerous diseases. Most of the gentlemen present were agriculturists, and they must have noticed animals taken to market with heads as big as a bushel, and it was quite possible that these transmitted the disease to other animals, and very possibly to human beings also. He thought it was a subject that this Society should take in hand. He would make it almost a penal offence for an animal suffering from cancer to be sold at a public market.

Mr. Jasper More, M.P., said that they were meeting in a building which was devoted to the objects of the medical profession, which after centuries of investigation and experiment had not up to the present time been able to throw any light upon cancer. They would, he was sure, be very grateful to the Royal Agricultural Society if they could assist them in this direction.

Vote of Thanks to Chairman.

The Earl of Portsmouth said that before they separated he should like to be allowed to propose a vote of thanks to his noble friend their Chairman. In Lord Coventry they had a nobleman who had identified himself with the agricultural interest for a great number of years. He had occupied many important public posts with great distinction to himself and great advantage to the public service. They were exceedingly fortunate in securing him for their President, and his knowledge of public affairs and of agriculture would prove of great service to the Society during the coming year.

Mr. Arthur Arkwright having seconded the resolution, the motion was put by the Secretary and carried unanimously.

The President acknowledged the compliment, and the proceedings then terminated.

PRIZE LIST

FOR

MAIDSTONE MEETING, JUNE 19 to 23, 1899.

Total value of Prizes offered (exclusive of Champion Prizes and Medals offered by Breed Societies), £6,354.

Of which amount £1,230 is contributed by the Maidstone Local Committee.

Closing Dates for Receipt of Entries, and Entry Fees.

Live Stock (Horses, Cattle Sheep, Pigs):—
Saturday, April 15, 1898, at 10s per Entry.
Monday, May 1, at 15s. per Post Entry.
Monday, May 15 (last day), at £1 per Late Entry.

Poultry and Farm Produce:—
Monday May 1, at 2s 6d. per Entry.
Monday, May 15 (last day), at 5s. per Post Entry.

Double Fees throughout to Non-Members of the Society.

An Exhibitor will be permitted to make, in the Classes for Live Stock and Poultry, as many entries in a Class as there are Prizes offered in that Class.

CHAMPION PRIZES.

The following Champion Prizes are offered by various Breed Societies &c :

Hunters' Improvement Society	Gold Medal for the best Hunter Filly not exceeding 3 years old.
Hackney Horse Society	Two Gold Medals for the best Hackney Stallion and for the best Mare or Filly.
Polo Pony Society	Two Gold Medals for the best Polo Pony Stallion, and for the best Brood Mare.
Shire Horse Society	Two Gold Medals for the best Shire Stallion, and for the best Mare or Filly.
Shorthorn Society	Two Prizes of £20 each for the best Shorthorn Bull and for the best Cow or Heifer.
Sussex Herd Book Society	Prize of £10 for the best Sussex Bull, Cow, or Heifer.
Polled Cattle Society	Gold Medal for the best Aberdeen Angus Bull, Cow or Heifer.
Kerry and Dexter Cattle Society	Two Prizes, value £21 for the best Kerry Bull, Cow or Heifer, and value £26 for the best Dexter Bull Cow or Heifer.
Lincoln Longwool Sheep Breeders' Association.	Prize of £10 10s. for the best Lincoln Ram.
Southdown Sheep Society	Prize of £10 10s. for the best Southdown Ram.
Suffolk Sheep Society	Gold Medal for best Suffolk Ram.
Maidstone Local Committee	Two Prizes of £15 15s. each for the best Kentish Ram, and for the best Pen of Three Kentish Ewes.
National Pig Breeders' Association	Four Gold Medals for the best Boar or Sow of the Large White, Middle White, Small White, and Tamworth breeds.
British Berkshire Society	Prize of £5 or the best Berkshire Boar or Sow.

HORSES (£1,835).

HUNTERS.

Class		Prizes 1st £	2nd £	3rd £
1	MARE, with foal at foot (15 st. and upwards)	15	10	5
2	MARE, with foal at foot (12 to 15 st.)	15	10	5
3	MARE OR GELDING (above 13 st. 7 lb.), foaled in '92, '93, or '94 [1]	20	10	5
4	MARE OR GELDING (not over 13 st. 7 lb.), foaled in '92, '93, or '94 [1]	20	10	5
5	MARE OR GELDING, foaled in 1895 [1]	20	10	5
6	GELDING, foaled in 1896 [1]	15	10	5
7	FILLY, foaled in 1896	15	10	5
8	GELDING, foaled in 1897 [1]	15	10	5
9	FILLY, foaled in 1897	15	10	5
10	GELDING, foaled in 1898 [1]	10	5	–
11	FILLY, foaled in 1898	10	5	–

CLEVELAND BAYS AND COACH HORSES.

Class		1st £	2nd £	3rd £
12	STALLION, foaled in 1896	15	10	5
13	STALLION, foaled in 1897	15	10	5
14	MARE (with foal at foot)	15	10	5
15	FILLY, foaled in '96 or '97	15	10	5

HACKNEYS.

Class		1st £	2nd £	3rd £
16	STALLION, foaled in 1896, 14 h. 2 in. and upwards	15	10	5
17	STALLION, foaled in 1897	15	10	5
18	STALLION, foaled in 1898	15	10	5
19	MARE (with foal at foot), 14 h. 2 in. and upwards	15	10	5
20	FILLY, foaled in 1897	15	10	5
21	FILLY, foaled in 1898	10	5	–
22	MARE OR GELDING, 14 h. 2 in. and upwards, foaled in 1892, 1893, 1894, or 1895 [1]	15	10	5
23	MARE OR GELDING, foaled in 1896 [1]	15	10	5

PONIES.

Class		1st £	2nd £	3rd £
24	STALLION, not over 14 hds.	15	10	5
25	MARE (with foal at foot), not over 14 hands	15	10	5
26	COLT, GELDING, OR FILLY, foaled in 1897, produce of Mare registered in or accepted by inspection for the Hackney Stud Book as a Pony, and which in the opinion of the Judges will not exceed 14 hands at 4 years old [1]	15	10	5
27	COLT, GELDING, OR FILLY, foaled in 1898 (same conditions as Class 26) [1]	15	10	5

SHETLAND PONIES.

Class		1st £	2nd £	3rd £
28	STALLION, foaled before or in 1895, not over 10½ hds [1]	7	3	–
29	MARE, foaled before or in 1895, not over 10½ hds.	7	3	–

MOUNTAIN AND MOORLAND PONIES.

Class		1st £	2nd £	3rd £
30	STALLION, foaled before or in 1895, not over 12 hands 2 inches	10	5	–
31	MARE, foaled before or in 1895, not over 12 hands 2 inches	10	5	–

POLO PONIES.

Class		1st £	2nd £	3rd £
32	STALLION, not exceeding 14 hands 2 inches [1]	15	10	5
33	STALLION (Eastern Ponies) not over 14 hands 2 inches [1]	15	10	5
34	STALLION, not over 13 hands 2 inches [1]	15	10	5
35	MARE, above 13-2 and not over 14-2 hds., with foal at foot, or to foal in '99 [1]	15	10	5
36	MARE, not over 13 hds. 2 ins., with foal at foot, or to foal in '99 [1]	15	10	5
37	COLT, GELDING, OR FILLY, foaled in 1896, not over 14 hands 1 inch [1]	10	7	3
38	COLT, GELDING, OR FILLY, foaled in 1897, not over 14 hands [1]	10	7	3
39	COLT, GELDING, OR FILLY, foaled in 1898 [1]	10	7	3

HARNESS HORSES AND PONIES.

To be driven in Single Harness.

Class		1st £	2nd £	3rd £
40	MARE OR GELDING, any age, above 15 hands [1]	15	10	5
41	MARE OR GELDING, any age, above 14 and not over 15 hands [1]	15	10	5
42	PONY MARE OR GELDING, any age, not over 14 h. [1]	15	10	5

SHIRE.

Class		1st £	2nd £	3rd £
43	STALLION, foaled in 1896	20	10	5
44	STALLION, foaled in 1897	20	10	5
45	STALLION, foaled in 1898	15	10	5
46	MARE (with foal at foot)	20	10	5
47	FILLY, foaled in 1896	15	10	5
48	FILLY, foaled in 1897	15	10	5
49	FILLY, foaled in 1898	15	10	5

[1] Offered by the Maidstone Local Committee.

CLYDESDALE.

Class		Prizes 1st £	2nd £	3rd £
50	STALLION, foaled in 1896	15	10	5
51	STALLION, foaled in 1897	15	10	5
52	STALLION, foaled in 1898	15	10	5
53	MARE (with foal at foot)	15	10	5
54	FILLY, foaled in 1896	15	10	5
55	FILLY, foaled in 1897	15	10	5
56	FILLY, foaled in 1898 [1]	15	10	5

SUFFOLK.

57	STALLION, foaled in 1896	15	10	5
58	STALLION, foaled in 1897	15	10	5
59	STALLION, foaled in 1898	15	10	5
60	MARE (with foal at foot)	15	10	5
61	FILLY, foaled in 1896	15	10	5
62	FILLY, foaled in 1897	15	10	5

AGRICULTURAL.

63	GELDING, foaled in 1895 [1]	15	10	5
64	GELDING, foaled in 1896 [1]	15	10	5

CATTLE (£1,770).

SHORTHORN.

65	BULL, calved in 1894, 1895, or 1896	15	10	5
66	BULL, calved in 1897	15	10	5
67	BULL, calved in 1898	15	10	5
68	COW, in-milk or in-calf, calved previously to or in 1895	15	10	5
69	HEIFER, in-milk or in-calf, calved in 1896	15	10	5
70	HEIFER, calved in 1897	15	10	5
71	HEIFER, calved in 1898	15	10	5

HEREFORD.

72	BULL, calved in 1894, 1895, or 1896	15	10	5
73	BULL, calved in 1897	15	10	5
74	BULL, calved in 1898	15	10	5
75	COW, in-milk or in-calf, calved previously to or in 1895	10	5	–
76	HEIFER, in-milk or in-calf, calved in 1896	10	5	–
77	HEIFER, calved in 1897	15	10	5
78	HEIFER, calved in 1898	15	10	5

DEVON.

79	BULL, calved in 1894, 1895, or 1896	15	10	5
80	BULL, calved in 1897 or 1898	15	10	5
81	COW, in-milk or in-calf, calved previously to or in 1895	15	10	5
82	HEIFER, in-milk or in-calf, calved in 1896	15	10	5
83	HEIFER, calved in 1897	10	5	–
84	HEIFER, calved in 1898	10	5	–

SUSSEX.

85	BULL, calved in 1894, 1895, or 1896	15	10	5
86	BULL, calved in 1897	15	10	5
87	BULL, calved in 1898 [1]	15	10	5
88	COW, in-milk or in-calf, calved previously to or in 1895	15	10	5
89	HEIFER, in-milk or in-calf, calved in 1896 [1]	15	10	5
90	HEIFER, calved in 1897	15	10	5
91	HEIFER, calved in 1898	15	10	5

LONGHORN.

92	BULL, of any age	10	5	–
93	COW OR HEIFER, in-milk or in-calf	10	5	–

WELSH.

94	BULL, calved in 1894, 1895, or 1896	15	10	5
95	BULL, calved in '97 or '98	15	10	5
96	COW OR HEIFER, in-milk or in calf, calved previously to or in 1896	15	10	5
97	HEIFER, calved in 1897	10	5	–
98	HEIFER, calved in 1898	10	5	–

RED POLLED.

99–103 Same as for Welsh.

ABERDEEN ANGUS.

104–108 Same as for Welsh.

GALLOWAY.

109–113 Same as for Welsh.

AYRSHIRE.

114–118 Same as for Welsh.

JERSEY.

119	BULL, calved in 1895, 1896, or 1897	15	10	5
120	BULL, calved in 1898	10	5	–
121	COW, in-milk, calved previously to or in 1896	15	10	5
122	HEIFER, in-milk or in-calf, calved in 1897	15	10	5
123	HEIFER, calved in 1898	15	10	5

GUERNSEY.

124	BULL, calved in 1895, 1896, or 1897	15	10	5
125	BULL, calved in 1898	10	5	–
126	COW OR HEIFER, in-milk or in-calf, calved previously to or in 1896	15	10	5
127	HEIFER, calved in 1897	10	5	–
128	HEIFER, calved in 1898	10	5	–

[1] Offered by the Maidstone Local Committee.

KERRY.

Class		Prizes 1st £	2nd £	3rd £
129	BULL, calved in 1896, 1897, or 1898	10	5	–
130	COW OR HEIFER, in-milk or in-calf, of any age	10	5	–

DEXTER.

131 & 132 Same as for Kerry.

DAIRY COWS

Class		1st £	2nd £	3rd £
133	COW, in-milk, of the SHORTHORN, AYRSHIRE, or other pure breed not named in Class 135, judged for the yield and quality of their milk combined, the milk to contain (on the average of two milkings) 12 per cent. of total solids, of which not less than 3 per cent. shall be fat	15	10	5
134	COW, in-milk, of any breed or cross, giving the largest quantity of milk, containing (on the average of two milkings) 12 per cent. of total solids, of which not less than 3 per cent. shall be fat	15	10	5
135	COW, in-milk, of the JERSEY, GUERNSEY, KERRY or DEXTER breeds, judged for their butter-producing qualities	15	10	5

SHEEP (£1,410).

LEICESTER.

Class		1st £	2nd £	3rd £
136	TWO-SHEAR RAM	10	5	–
137	SHEARLING RAM	15	10	5
138	THREE RAM LAMBS, dropped in 1899	10	5	–
139	THREE SHEARLING EWES	15	10	5
140	THREE EWE LAMBS, dropped in 1899	10	5	–

COTSWOLD.

141–145 Same as for Leicester.

LINCOLN.

Class		1st £	2nd £	3rd £
146	TWO-SHEAR RAM	10	5	–
147	SHEARLING RAM	15	10	5
148	FIVE SHEARLING RAMS[1]	15	10	5
149	THREE RAM LAMBS, dropped in 1899	10	5	–
150	THREE SHEARLING EWES	15	10	5
151	THREE EWE LAMBS, dropped in 1899	10	5	–

OXFORD DOWN.

152–156 Same as for Leicester.

SHROPSHIRE.

157–161 Same as for Leicester.

SOUTHDOWN.

Class		1st £	2nd £	3rd £
162	TWO-SHEAR RAM	15	10	5
163	SHEARLING RAM	15	10	5
164	THREE RAM LAMBS, dropped in 1899	15	10	5
165	THREE EWES, other than Shearling[1]	15	10	5
166	THREE SHEARLING EWES	15	10	5
167	THREE EWE LAMBS, dropped in 1899	15	10	5

HAMPSHIRE DOWN.

168–172 Same as for Leicester.

SUFFOLK.

173–177 Same as for Leicester.

BORDER LEICESTER.

Class		1st £	2nd £	3rd £
178	TWO-SHEAR RAM	10	5	–
179	SHEARLING RAM	15	10	5
180	THREE SHEARLING EWES	15	10	5

KENTISH OR ROMNEY MARSH.

Class		1st £	2nd £	3rd £
181	RAM, two-Shear and upwards	15	10	5
182	SHEARLING RAM	15	10	5
183	THREE RAM LAMBS, dropped in 1899[1]	10	5	–
184	THREE EWES, other than Shearling[1]	15	10	5
185	THREE SHEARLING EWES	15	10	5
186	THREE EWE LAMBS, dropped in 1899[1]	10	5	–

WENSLEYDALE.

Class		1st £	2nd £	3rd £
187	TWO-SHEAR OR SHEARLING RAM	10	5	–
188	THREE SHEARLING EWES	10	5	–

DEVON LONG-WOOLLED.

189 & 190 Same as for Wensleydale.

SOMERSET AND DORSET HORN.

Class		1st £	2nd £	3rd £
191	SHEARLING RAM, dropped after November 1, 1897	10	5	–
192	THREE SHEARLING EWES dropped after November 1, 1897	10	5	–

CHEVIOT.

193 & 194 Same as for Wensleydale.

BLACK-FACED MOUNTAIN.

195 & 196 Same as for Wensleydale.

HERDWICK.

197 & 198 Same as for Wensleydale.

WELSH MOUNTAIN.

199 & 200 Same as for Wensleydale.

[1] Offered by the Maidstone Local Committee.

PIGS (£360).

Classes		
201—204	Large White . .	For Prizes see below
205—208	Middle White . .	
209—212	Small White . .	
213—216	Berkshire . . .	
217—220	Tamworth . .	

In each of the above Breeds the following prizes will be given:—

	1st £	2nd £	3rd £
BOAR, farrowed in 1897 or 1898	10	5	3
THREE BOAR PIGS, farrowed in 1899	10	5	3
BREEDING SOW, farrowed in 1897 or 1898 . .	10	5	3
THREE SOW PIGS, farrowed in 1899	10	5	3

POULTRY (£268).

Prizes are offered for the best COCK, HEN, COCKEREL, and PULLET of the following Breeds:—

Classes		s.	s.	s.
221—224	Game, Old English .	30	15	10
225—228	Game, Indian . .	30	15	10
229—232	Dorking, Coloured .	30	15	10
233—236	Dorking, Silver Grey	30	15	10
237 & 238	Dorking, White or Cuckoo .	30	15	10
239—244	Brahma and Cochin .	30	15	10
245—248	Langshan . . .	30	15	10
249—252	Plymouth Rock .	30	15	10
253—262	Wyandotte . .	30	15	10
263—266	Orpington . .	30	15	10
267—270	Houdan . . .	30	15	10
271 & 272	French (Houdan excepted) . .	30	15	10
273—276	Minorca . . .	30	15	10
277—282	Leghorn . . .	30	15	10
283 & 284	Andalusian . .	30	15	10
285 & 286	Hamburgh . .	30	15	10
287—290	Any other breed (except Bantams) .	30	15	10
291	Aylesbury Drake . .	30	15	10
292	Aylesbury Duck .	30	15	10
293	Aylesbury Young Drake .	30	15	10
294	Aylesbury Duckling .	30	15	10
295	Rouen Drake . .	30	15	10
296	Rouen Duck . .	30	15	10
297	Pekin Drake . .	30	15	10
298	Pekin Duck . .	30	15	10
299	Cayuga Drake . .	30	15	10
300	Cayuga Duck . .	30	15	10
301	Any Breed (except Aylesbury) Young Drake	30	15	10
302	Ditto, Duckling . .	30	15	10
303	Gander, Embden . .	40	20	10
304	Goose, Embden . .	40	20	10
305	Gander, Toulouse . .	40	20	10
306	Goose, Toulouse . .	40	20	10
307	Turkey Cock . . .	40	20	10
308	Turkey Hen . . .	40	20	10

Class	*Table Poultry.*	Prizes 1st s.	2nd s.	3rd s.
309	Pair of Cockerels of any pure breed . . .	30	15	10
310	Pair of Pullets, ditto . .	30	15	10
311	Pair of Cockerels of an Indian Game-Dorking or Dorking-Indian Game 1st cross . . .	30	15	10
312	Pair of Pullets, ditto .	30	15	10
313	Pair of Cockerels of a 1st cross from any pure breeds (*Indian Game-Dorking and Dorking-Indian Game excepted*) .	30	15	10
314	Pair of Pullets, ditto . .	30	15	10
	Table Ducklings.			
315	Pair of Ducklings of any pure breed . . .	30	15	10
316	Pair of Ducklings of 1st cross from pure breeds .	30	15	10

PRODUCE (£539).

BUTTER.

317 Keg or other Package of BUTTER not less than 14 lb. and under 40 lb. in weight (entries close April 15, 1899). 1st 10*l*., 2nd 5*l*.

318 Box of Twelve 2 lb. Rolls of BUTTER, not more than 1 per cent. salt. 1st 5*l*., 2nd 3*l*., 3rd 2*l*.

319 2 lb. FRESH BUTTER, slightly salted, made up in pounds — Four of 5*l*. each. Four of 3*l*. each. Four of 1*l*. each.

320 2 lb. FRESH BUTTER, slightly salted, made up in pounds, from milk drawn from Cows other than Channel Islands or Cows crossed with Channel Islands breeds. — Four of 5*l*. each. Four of 3*l*. each. Four of 1*l*. each.

CHEESE.

		1st £	2nd £	3rd £	4th £
321	THREE CHEDDAR, of not less than 50 lb. each, made in 1899 .	10	5	3	–
322	THREE CHESHIRE, of not less than 40 lb. each, made in 1899 .	10	5	3	–
323	THREE STILTON, made in 1899 . . .	10	5	3	–
324	THREE WENSLEYDALE, made in 1899 .	5	3	2	–
325	THREE CHEESES, of any other British make, made in 1899 .	10	5	3	2
326	THREE CREAM CHEESES, made with the use of Rennet .	2	1	–	–
327	THREE CREAM CHEESES, made without the use of Rennet	2	1	–	–

CIDER AND PERRY.

Class		1st £	2nd £	3rd £
328	Cask of CIDER, made 1898	5	3	2
329	ONE DOZ. CIDER, made 1898	5	3	2
330	ONE DOZ. CIDER, made before 1898 . . .	5	3	2
331	ONE DOZ. PERRY .	5	3	2

HOPS.

Class		1st £	2nd £	3rd £
332	Pocket of EAST KENT HOPS[1]	20	10	5
333	Pocket of MID KENT HOPS[1]	20	10	5
334	Pocket of WEALD OF KENT HOPS[1]	20	10	5
335	Pocket of HANTS OR SURREY HOPS[1] . . .	20	10	5
336	Pocket of HEREFORD OR WORCESTER HOPS[1] .	20	10	5
337	Pocket of SUSSEX HOPS[1] .	20	10	5

(Entries for Hops closed Nov. 1, 1898.)

PRESERVED FRUITS AND VEGETABLES.

Class		1st £	2nd £
338	Collection of DRIED OR EVAPORATED FRUITS[1]	5	3
339	Collection of DRIED OR EVAPORATED VEGETABLES[1] . .	5	3
340	Collection of BOTTLED FRUITS (whole fruit), to be shown in clear glass bottles[1] . . .	5	3
341	Colln. of PRESERVED FRUITS for Dessert purposes, in boxes or other suitable receptacles[1] .	5	3
342	Collection of JAMS, to be shown in 1 lb. clear glass jars[1] . .	5	3

HIVES, HONEY, AND BEE APPLIANCES.

Offered by British Bee-keepers' Association.

Class		1st s.	2nd s.	3rd s.	4th s.
343	Collection of HIVES .	80	50	30	–
344	OUTFIT FOR BEGINNER	30	20	15	–
345	OBSERVATORY HIVE (not less than 2 frames)	30	20	10	–
346	OBSERVATORY HIVE (single frame) . .	30	20	10	–
347	FRAME HIVE . .	20	15	10	–
348	Do. for Cottagers' use	20	15	10	–
349	HONEY EXTRACTOR .	15	10	–	–
350	USEFUL APPLIANCES .	20	10	5	–
351	12 Sections of COMB HONEY ('99), about 12 lb.	20	15	10	5
352	12 Sections of COMB HONEY ('98 or previous years), about 12 lb. .	20	15	10	5
353	12 Sections of COMB HEATHER HONEY of any year, about 12 lb. .	20	15	10	5
354	3 Shallow Frames of COMB HONEY, 1899 .	20	15	10	5
355	RUN OR EXTRACTED LIGHT COLOURED HONEY ('99), about 12 lb.	20	15	10	5
356	RUN OR EXTRACTED DARK COLD. HONEY ('99), about 12 lb. .	20	15	10	5
357	RUN OR EXTRACTED HONEY ('98 or previous years)	20	15	10	5
358	RUN OR EXTRACTED HEATHER HONEY ('98), about 12 lb. . . .	20	15	10	5
359	GRANULATED HONEY ('98), about 12 lb. .	20	15	10	5
360	DISPLAY OF HONEY .	40	30	20	10
361	3 lb. of WAX . .	15	10	7/6	5
362	3 lb. of WAX, in marketable form, suitable for retail trade . . .	15	10	7/6	5
363	HONEY VINEGAR ½ gall.	7/6	5	–	–
364	MEAD ½ gallon .	7/6	5	–	–
365	OTHER PRACTICAL EXHIBITS	20	15	10	–
366	OTHER SCIENTIFIC EXHIBITS	20	15	10	–

IMPLEMENTS (£140).

		1st £	2nd £
I.	MACHINE FOR WASHING HOPS WITH LIQUID INSECTICIDES, TO BE WORKED BY HORSE POWER OR MECHANICAL POWER. . .	50	–
II.	CREAM SEPARATOR. POWER MACHINE, SUITABLE FOR FARM USE	20	10
III.	CREAM SEPARATOR. HAND POWER MACHINE, THE POWER TAKEN TO DRIVE THE SAME NOT TO EXCEED 2,500 FOOT LBS. . .	20	10
IV.	MACHINE FOR THE EVAPORATION OF FRUIT AND VEGETABLES[1] .	20	–
V.	PACKAGE FOR THE CARRIAGE OF SOFT FRUIT[1]	5	–
VI.	Do. Do. Do. HARD FRUIT[1]	5	–

[1] Offered by the Maidstone Local Committee.

HORSE-SHOEING COMPETITIONS (£32).

(Open to the United Kingdom.)

CLASS I. LIGHT HORSES (*Tuesday, June* 20, and, if required, *Wednesday, June* 21).
CLASS II. HEAVY HORSES (*Thursday, June* 22, and, if required, *Friday, June* 23).
PRIZES amounting to 16*l.* are offered in each class.

Copies of the detailed Prize Sheet and Regulations (both for Stock and Implements) may be obtained on application to the Secretary of the Society at 13 *Hanover Square, London, W.*

Date of issue.	Date of issue.	Date of issue.